No. 5 Original

IN THE

Supreme Court of the United States

OCTOBER TERM, 1942

THE STATE OF COLORADO, COMPLAINANT,

vs.

THE STATE OF KANSAS AND THE FINNEY COUNTY WATER USERS' ASSOCIATION, A CORPORATION, DEFENDANTS.

REPLY BRIEF FOR COMPLAINANT, THE STATE OF COLORADO.

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THE ISSUES PRESENTED BY THE DEFENDANTS' BRIEF.

At the beginning of this reply brief, it will be well for us to evaluate the issues between the parties as they now appear. Considering only fundamental matters, the situation may be summarized thus:

1. Defendants do not contest the right of the complainant to the injunction against the further prosecution of the Finney County cases.

2. Defendants do not accept the decision in *Kansas v. Colorado* as a final determination of the rights of the western Kansas counties to water for irrigation purposes. On the other hand the complainant contends that such decision is *res adjudicata* on the issues raised by the defendants' cross-bills.

3. Upon the basis of the so-called "analytical study"

of witness Meeker and "stabilized consumptive use" theory of witness Knapp, defendants urge that there has been a material increase by Colorado in the depletion of the flow of the Arkansas since the former decision. Colorado says that there has been no increased depletion of the stream flow by it since 1907 because the record shows (a) a decline in consumptive uses in Colorado (ditch diversions less returns to the river), (b) an increase in divertible and usable state line flows since 1907, (c) an increase in Kansas ditch diversions since 1907, (d) an increase in Kansas irrigated acreage.

4. Kansas asserts that it has been injured because there are within its borders irrigable lands, which would have been irrigated except for the alleged stream depletions in Colorado. Colorado contends that Kansas has not been injured because (a) Kansas population has increased, (b) Kansas agricultural production has increased, (c) Kansas irrigated acreage has increased, (d) the prosperity and general welfare of the great body of the valley in Kansas has greatly improved since the 1907 decision.

5. Kansas argues for a decree which will both define legal rights and provide for adequate administration so as to assure Kansas a definite amount of water each year. Colorado says that it cannot guarantee water production and that in any definition of its legal rights Kansas should not be given a greater or more regular supply than existed in a condition of nature. Colorado says further that the function of the Court is limited to the definition of legal rights and does not encompass the field of administration.

6. Kansas denies that the 1916 Settlement has any place in determining the equitable apportionment of the stream flow and entirely ignores the 1933 Stipulation. Colorado says that both these agreements were made in good faith and should be given great, if not controlling, weight in determining the amount of water to which Kansas is entitled.

7. Kansas treats of Caddoa reservoir as a Colorado project which constitutes a threat of further stream deple-

tion. Colorado says that Caddoa is a Federal project which was sponsored by both states and which should be used for the conservation storage of water for the benefit of both states and for aid in the settlement of this prolonged controversy.

In contrast to these differences between the parties there is one thing in which they are in agreement. They all say that the recommendations of the Special Master as to the apportionment of the water between the States are uncertain, ambiguous and confusing and must not be adopted by this Court.

ON THE QUESTION OF EQUITABLE APPORTIONMENT THE RULE OF RES ADJUDICATA APPLIES UNLESS KANSAS SUSTAINS THE BURDEN OF SHOWING THAT SINCE 1907 IT HAS SUFFERED INJURY TO ITS SUBSTANTIAL INTERESTS AS A RESULT OF MATERIALLY INCREASED STREAM DEPLETIONS IN COLORADO.

(a) The Rule of Res Adjudicata.[1]

The law in relation to the effect of a judgment between the same parties and involving the same subject matter is well known *(Werlein v. New Orleans,* 177 U. S. 390). One trial of an issue is enough *(Treines v. Sunshine Mining Co.,* 308 U. S. 66, 78). A party is not at liberty to prosecute a claim by piecemeal, as by presenting a part only of the available grounds and reserving others for another suit, if failing in the first *(Grubb v. Public Utilities Commission of Ohio,* 281 U. S. 470, 479). It was well said in *Stoll v. Gottlieb,* 305 U. S. 165, 172:

> "Courts to determine the rights of parties are an integral part of our system of government. It is just as important that there should be a place to end as that there should be a place to begin litigation. • • • There is no reason to expect that the second decision will be more satisfactory than the first."

Since the rule applies against the United States in actions brought by it *(U. S. v. California & Oregon Land*

[1]Colorado has pleaded *res adjudicata*—see Bill of Complaint, pp. 21-22, Reply p. 12.

Co., 192 U. S. 355), there is no reason why it should not apply in actions between states.

The rule is that a judgment upon the merits in one suit is *res adjudicata* in another where the parties and subject-matter are the same, not only as respects matters actually presented to sustain or defeat the right asserted but also as respects any other available matter which might have been presented to that end (*Grubb v. Public Utilities Commission of Ohio, supra*, p. 479; *Chicot County Drainage District v. Baxter State Bank*, 308 U. S. 371, 378).

All the reasons for the rule of *res adjudicata* are magnified a hundred fold in a situation such as is presented in this case. Here we have a social-economic problem which vitally affects the more than 500,000 people living in the 46,000 square miles constituting the Arkansas river basin in Colorado and Kansas.[2] Even in a country as large as the United States, the stability of such a civilization is of importance to the national welfare.

For thirty-five years the farmers, who through their enterprise, ingenuity and energy have converted into a prosperous agricultural community a section classified as a desert in the days of the famous Santa Fe Trail, have invested their money, tilled their fields and established their homes with the understanding that in 1907 this Court, as the sole arbiter, had ruled upon the rights of the states in connection with the use of Arkansas river water. The faith of the people should not be destroyed by a present reexamination or reconsideration of the issues then determined. This requires that in the case at bar the litigants and the Court should start from the premise that by the 1907 decision this Court held that Colorado was not exceeding its equitable share of use of Arkansas river water and that it could increase that use until by a material increase in stream depletion to the injury of the substan-

[2]The 1940 census shows a population of 504,000 in the counties of the two states crossed by the main channel of the river. If counties within the basin but not crossed by the main river were included, the population figures would be considerably higher.

tial interests of Kansas, it destroyed the equitable apportionment of benefits then existing.

(b) The Controlling Issue in the Former Case Was Equitable Apportionment.

Kansas argues (Brief, p. 45) that the equitable division of the water supply of the Arkansas river between Colorado and Kansas is in this case before the Court for the first time. We deny the validity of that contention and say that in its former decision this Court held not only that Colorado was not by its uses taking more than its share of Arkansas river water but also that Colorado could increase its uses until there resulted an injury to the substantial interests of Kansas.

The difference between the two positions is that Kansas urges that there is no equitable apportionment unless there is a decree dividing the water supply. Colorado says that in the application of the rule of equitable apportionment it is never necessary or proper for the Court to make a decree dividing the water supply, a decree which imposes a restriction or limitation upon the quasi-sovereignty of the upper state, unless the upper state has, by the taking of more than its share, inflicted an injury of serious magniture on a lower state.

In the opinion written by Justice Brewer in *Kansas v. Colorado*, this Court for the first time expounded the principle of equitable apportionment as the test in determing the rights of states in controversies over the use of the waters of an interstate stream. But it did not stop there. It applied the principle to the facts then before it. After referring to a decision of the Kansas Supreme Court (*Clark v. Allaman*, 71 Kan. 206, 80 Pac. 571) wherein the rule of reasonable use was given effect as between individual riparian proprietors, this Court said (206 U. S. 104-105):

> "As Kansas thus recognizes the right of appropriating the waters of a stream for the purposes of irrigation, subject to the condition of an equitable di-

vision between the riparian proprietors, she cannot complain if the same rule is administered between herself and a sister state."

Following that statement the Court entered upon a discussion of the facts relative to the Arkansas basin and the use of water therein and concluded its review of that evidence with this (206 U. S. 113-114):

> "It cannot be denied, in view of all the testimony (for that which we have quoted is but a sample of much more bearing upon the question), that the diminution of the flow of water in the river by the irrigation of Colorado has worked some detriment to the southwestern part of Kansas, and yet, *when we compare the amount of this detriment with the great benefit which has obviously resulted to the counties in Colorado*,[3] it would seem that equality of right and equity between the two states forbids any interference with the present withdrawal of water in Colorado for purposes of irrigation."

The direction for a decree is in this language (206 U. S. 117):

> "The decree which, therefore, will be entered, will be one dismissing the petition of the intervener, without prejudice to the rights of the United States to take such action as it shall deem necessary to preserve or improve the navigability of the Arkansas river. The decree will also dismiss the bill of the State of Kansas as against all the defendants, without prejudice to the right of the plaintiff to institute new proceedings whenever it shall appear that, through a material increase in the depletion of the waters of the Arkansas by Colorado, its corporations or citizens, the substantial interests of Kansas are being injured to the extent of destroying the equitable apportionment of benefits between the two states resulting from the flow of the river."

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[3]All italics in this brief are supplied by the author.

The effect of such a decree is not obscure. The Court says, plainly and unmistakably, that Colorado has not by its water uses taken more than its share of the flow of the stream than it is entitled to take under the principle of equitable apportionment. *Since Colorado uses were within the share of the state, there was no reason to make any precise definition of rights.* It is particularly noteworthy that the Court did not forbid further irrigation expansion in Colorado. Rather it recognized that such would take place and accordingly permitted Kansas to sue again when, as a result of such additional uses, the equitable apportionment between the two states was destroyed. As a warning perhaps to Colorado and as a guide to Kansas, the Court expressly stated the conditions under which Kansas might again sue for relief. These were (a) a material increase in stream depletions by Colorado and (b) a resulting injury to the substantial interests of Kansas. Kansas has not sustained the burden of satisfying these conditions. Hence, the 1907 decision is *res adjudicata.*

(c) The Rights of the Western Kansas Counties For Irrigation Water Were at Issue In, And Are Concluded By, the 1907 Decision.

The theme song of the defendants' brief is that this case involves, from the Kansas standpoint, only the western counties of that state wherein irrigation is practiced from the surface flows of the river. An attempt seems to be made to leave the impression that these irrigation uses were not presented in the former litigation and were not determined by the former decision.

The reason for the Kansas position is apparent. In the former suit Kansas alleged and sought to prove injury to the entire basin within its borders. It failed to make out a case. It hopes that by confining this suit to the small western portion of the basin in Kansas, it can obtain a decree which, through the curtailment of existing Colorado uses, will result in additional water being made available for irrigation in western Kansas. The growth and prosperity of "the great body of the valley" in Kansas has

been such that if Kansas was not entitled to relief in 1907, it certainly is not entitled to relief now.

Kansas itself injected into the other case the use of water for irrigation in its western counties. To sustain its allegations of injuries, it averred among other things that (206 U. S. 52) "the water for irrigation ditches in the western part of Kansas has been entirely cut off" and "the irrigation ditches are left dry and the lands uncultivated." The Court in its opinion referred to the irrigation ditches in western Kansas, saying (206 U. S. 113-114):

> "At one time there were some irrigating ditches in these western counties, which promised to be valuable in supplying water, and thus increasing the productiveness of the lands in the vicinity of the stream, and *it is true that those ditches have ceased to be of much value,* the flow in them having largely diminished."

And that

> " • • • the diminution of the flow of water in the river by the irrigation of Colorado has worked some detriment to the southwestern part of Kansas • • • ."

After finding such to be the facts, the Court went on to say (206 U. S. 114):

> " • • • and yet when we compare the amount of this detriment with the great benefit which has obviously resulted in the counties in Colorado, it would seem that equality of right and equity between the two states forbids any interference with the present withdrawal of water in Colorado for purposes of irrigation."

Thus the irrefutable records disclose that in the former case the irrigation uses in the western Kansas counties were presented to the Court and taken into consideration by the Court in making its decision. *There is no claim of any worsening in condition since the former decision.* In-

deed the record shows that agricultural production in general, and irrigated acreages in particular, have increased. Since this Court held that the Colorado uses did not in 1907 exceed the share of the state under the principle of equitable apportionment, it would seem to be established beyond cavil that the present Colorado uses are within the share of the state. How can it be said that any restriction is now required on the Colorado uses because of irrigation conditions in western Kansas when those conditions are greatly improved?

(d) The Kansas Claim of a Right to Receive a Fixed Percentage of Index Flows is Contrary to the Former Decision.

Kansas by its exceptions to the Report of the Master and the arguments advanced in its brief contends for a decree which will award to it a fixed percentage of certain index flows. Specifically it asks for 30.87% of the combined flow of the stream at the gaging stations located at Canon City and at the mouth of the Purgatoire. Any award to Kansas of such an amount of water will run contrary to the 1907 decision, and will violate the rule of *res adjudicata*.

In its opinion in *Kansas v. Colorado* the Court pointed out that the Colorado decrees exceeded in amount the flow of the river at Canon City. We quote from 206 U. S. 106-107:

> "The amount of water authorized to be taken by the (Colorado) ditches from the river is, as alleged in the bill, 4,200 cubic feet, and from its affluents and tributaries 4,300 feet. * * * The average flow of the river as it comes out of the Royal Gorge at Canon City is, as shown by official measurements for a series of years 750 cubic feet. *So that it appears that the irrigating ditches are authorized to take from the Arkansas river much more water than passes in the channel into the valley.* It is not clear what surplus water, if any, comes out of the tributaries. There are some twenty-five of them, the average flow from four of which into the Arkansas is 313 cubic feet. Aside

from this surplus water some may be returned through overflow of the ditches or from seepage. What either of these amounts may be is not disclosed."

Thus in 1907 the Court recognized that Colorado ditch priorities from the main stream amounted to at least 4,200 c.f.s.[4] while the flow of the river at Canon City was 750 c.f.s. and still it held that Colorado had not exceeded its equitable share of river flow.

Now Kansas asks that 30.87% of the Canon City flow be required to pass to the state line for delivery to it. A decree which would have such effect would run directly contrary to the 1907 decision. *Every drop of the Canon City flow was required by the Colorado priorities in 1907.* It takes no great mathematical ability to figure that the satisfaction of decrees amounting, as alleged in the Kansas bill to 4,200 c.f.s. but actually amounting to over 6,000 c.f.s.,[5] requires the use of a flow of 750 c.f.s. many times. The only result which can be gained from the application of the Court's opinion to this situation is that the Court then considered that Colorado was entitled to divert and use the entire Canon City flow.

In 1907 the Court did not require Colorado to pass any of the Canon City flow to Kansas. Now, thirty-five years later, after irrigation conditions in western Kansas have improved and after Colorado users have invested their money and carried on their enterprises upon the basis that they were not required to pass any of the Canon City flow to Kansas, it would be a violation of the rule of *res adjudicata* to award to Kansas any fixed percent of the Canon City flow.

Kansas witness Meeker finally admitted notwithstanding his effort to show increased depletion since 1907 that "I think that the direct river flow was pretty well depleted in 1905, and that the depletion since that time has come from both winter flow, and considerable flood water, and some direct flow" (Tr. p. 2095). And that he meant that

[4]Cubic feet per second of time.
[5]See Colorado Opening Brief, p. 5.

the dependable flow or the normal seasonal flow occurring during the irrigation season, which is chiefly mountain run-off, was being largely consumed in Colorado by 1905 (Tr. p. 2173).

(c) The Presence of The Finney County Water Users' Association as A Defendant Does Not Affect The Applicability of The Rule of Res Adjudicata.

Colorado joined The Finney County Water Users' Association as a defendant because the purpose of the complaint was primarily to secure an injunction against the further prosecution of the two cases brought by that Association against individual Colorado water users in the United States District Court for the District of Colorado. However, the presence of this private water user as a defendant has no effect on the applicability of the rule of *res adjudicata* so far as the issues raised by the cross-bills are concerned.

In the former case Kansas joined with Colorado as defendants certain private Colorado water users who appeared and presented evidence and argument. This Court said with reference to such private interests (206 U. S. 85):

> "While several of the defendant corporations have answered, it is unnecessary to specially consider their defenses, for, if the case against Colorado fails, it fails also against them."

In the Laramie river case the Court expressed the idea with this language (*Wyoming v. Colorado*, 259 U. S. 468):

> "Thus the interests of the state are indissolubly linked with the rights of the appropriators."

In its second decision in the Laramie river controversy the Court said (*Wyoming v. Colorado*, 286 U. S. 494, 508-509):

> "But it is said that water claims other than the tunnel appropriation could not be, and were not, affected by the decree, because the claimants were not

parties to the suit or represented therein. In this the nature of the suit is misconceived. It was one between states, each acting as a quasi-sovereign and representative of the interests and rights of her people in a controversy with the other. Counsel for Colorado insisted in their brief in that suit that the controversy was 'not between private parties' but 'between the two sovereignties of Wyoming and Colorado'; and this court in its opinion assented to that view, but observed that the controversy was one of immediate and deep concern to both states and that the interests of each were indissolubly linked with those of her appropriators. * * * Decisions in other cases also warrant the conclusion that the water claimants in Colorado, and those in Wyoming, were represented by their respective states and are bound by the decree."

Hence the Finney County Association was represented by the state of Kansas in the former suit and is bound by the decision therein.

The appropriation claimed for the Farmers ditch of the Association is under a date of 1880 (Kansas Answer, p. 34). In fact the dates claimed for all the Kansas ditches are within the period 1879 to 1892 (Kansas Answer, pp. 33-34). There is no claim of the initiation of any new rights since 1907 and there is no claim of any worsening of conditions under any of the ditches since 1907. *Hence whatever rights any of these ditches had were before the Court in the former case and are forever concluded by that decision.*

EQUITABLE APPORTIONMENT.

(a) The Kansas Theory of Equity of Need Constitutes an Indirect Attack Upon the 1907 Decision.

On pages 52 to 61 of their brief the defendants set forth their theory that the primary factor in the determination of equitable apportionment is equity of need. Their argument is that there is a similarity of conditions in the western Kansas and eastern Colorado counties along the

Arkansas river and that, since the need of water for irrigation in Kansas is allegedly as great as the need for water for irrigation in Colorado, they have an equal need of water for irrigation.

There is no assertion that the conditions in Kansas are any different now than they were at the time of the former suit. Consequently, whatever may have been the need of the western Kansas counties for water for irrigation purposes it was a factor which was presented to, and determined by, the 1907 decision of this Court. Under the rule of *res adjudicata,* which we have heretofore discussed, that decision is conclusive. The assertion of the theory of equity of need is an attempt to secure a relitigation of the issues decided by this Court thirty-six years ago.

On page 61 of their brief the defendants directly attack the finding made by this Court in its 1907 decision that (206 U. S. 109):

> " • • • reliance upon mere cultivation of the soil would not have anything like the effect in Colorado that it has had in Kansas, and that the barrenness which characterized portions of the territory in Colorado would have continued for an indefinite time unless relieved by irrigation."

This criticism of the former decision is unjustified. The only basis for it is that certain Kansas evidence indicates that crop yields on unirrigated lands in certain Colorado and Kansas counties in the Arkansas river basin are quite similar. It would seem that the entire argument for Kansas is answered by the statement made in their brief on page 60:

> "It is not maintained that these comparisons indicate that dry land farming in either area can be classified on the basis of successful agriculture • • •."

Thus Kansas bases its contention upon a form of agriculture which it implies is not successful. There can be no question that irrigated agriculture along the Arkansas river basin in Colorado is successful. Likewise, there is no

question that agriculture in the western Kansas counties is successful without irrigation. Colorado Exhibit 68 shows that in the period 1921 to 1930 the five western Kansas counties on the channel of the Arkansas river had an average acreage in field crops of 910,342 acres, and that the average value of the field crops was $12,285,400 (Colo. Ex. 68, Tr. p. 3003, App. B, p. 15). Of these 910,342 acres of field crops there were in 1929 only 60,897 acres irrigated. It is thus obvious that *irrigation plays but a minor part in the agriculture of these five Kansas counties.* They have since the 1907 decision grown in population and increased their production. Whatever their need for water may be, it was determined by the 1907 decision.

(b) Need for Water is But One of Several Factors which Must Be Considered in Applying the Rule of Equitable Apportionment.

Kansas presents its theory of equity of need as though the need for water was the sole consideration in arriving at an equitable apportionment of the flow of an interstate stream. Most obviously the need for water is a matter which merits consideration, but there are other matters just as important.

It has been said that equitable apportionment is a nebulous ideal that yields but little to precedent and still less to rigid formula and always can be fitted to the needs of the times and to the general welfare in any particular case.[6]

In *Connecticut v. Massachusetts,* 282 U. S. 660, 670, this Court, after remarking that equity of right between states does not require an equal division of the waters of an interstate stream among the states through which it flows, said that in determining equitable apportionment the principles of right and equity shall be applied having regard to the "equal level or plane on which all the states stand, in point of power and rights, under our constitutional system."

[6] See Article by Ernest Carman entitled, "Is There a New Era in the Law of Interstate Waters," 5 Southern California Law Review 25, 34-35.

Without quibbling over a formula, let us briefly examine the traditions and practices in the Arkansas river basin with the thought of arriving at certain basic facts which must be recognized to effectuate an equitable apportionment between Colorado and Kansas.

At the outset it should be noted that the basic conflict is between water uses in the upper and lower levels of the stream. Such a conflict is not new in the West. It has arisen often between private individuals. It was because of this conflict that the Colorado River Compact was made prior to the extensive developments on that stream. It is the basic consideration of not only this case but also the North Platte river case (*Nebraska v. Wyoming and Colorado, United States Intervener,* Original No. 7, October 1943 Term). Mention of the pending North Platte case is made because it would seem that if in this case the Colorado contentions of no injury and *res adjudicata* are not to be sustained and if the Court is to add to the body of the federal common law pertaining to interstate streams, the treatment of the upper and lower levels of these stream systems should be based on parallel and not upon divergent principles.

The streams of the Mississippi river basin rising in the eastern portion of the Rocky Mountains after leaving the mountains flow first through a section where the rainfall is very substantially less than in the high mountains. In this belt rainfall tends to decrease for 100 to 150 miles easterly from the mountains, then it again increases until at points 250 to 350 miles from the mountains there is unquestionably adequate precipitation to sustain successful agriculture. The need for water to grow crops resulted in the construction of irrigation ditches in the plains section just east of the mountains. The success of the first enterprises attracted new settlers and considerable amounts of capital. Large canals were built and storage reservoirs were provided to supplement the late summer supplies. Farmers living in this area realized their utter dependence upon water. They readily invested large sums and paid

substantial maintenance and operation charges in order to secure water for their crops. Further east in the area where the precipitation was greater irrigation enterprises such as the Garden City group of ditches in Kansas were planned and to some extent constructed in the 1880's. However, in this area the farmers look upon the water necessary for their crops as a bounty which they should receive from nature. In many, perhaps in most years, rainfall is sufficient to produce a crop. Hence the farmers in this area were and are reluctant to invest money in, or to pay maintenance and operation charges on, irrigation projects. Water was something which they should receive free, not something for which they should pay. The history of the Kansas irrigation enterprises has been duplicated in other sections. We have recounted in our review of the evidence in Appendix A, pp. 108-109, how the Kansas ditches became bankrupt and went into receivership, how the farmers refused to buy water from the receivers and how the farmers refused to pay operation and maintenance charges on a Bureau of Reclamation pumping project. The result has been that in the upper area where the farmers need irrigation water every year, the irrigation enterprises have been constantly improved so that the most efficient use of the supply of water may be obtained. In the lower levels the farmers even to this day look upon irrigation as merely a form of insurance against crop failure at times of deficient rainfall.

The bearing which this situation has upon an equitable apportionment between the two levels represented by the states of Colorado and Kansas is important. The use of water to irrigate crops has unquestioned social value. The history of the region shows that in Colorado the necessity for, and value of, the use of water for irrigation has always been of preeminent importance. In Kansas it has had a less important place. In other words, *the relative social value of the use of water for irrigation in Colorado has always been greater than it has in Kansas.*

Another factor is that the irrigated acreage in Colo-

rado begins near the headwaters and the irrigated acreage in Kansas begins several hundred miles downstream. No knowledge of engineering is necessary to understand the desirability of utilizing stream flows as near the headwaters as is possible. As is pointed out in our former brief and Appendix A thereto, the Arkansas river, in common with similar streams, loses water by evaporation, transpiration and percolation as it crosses the Great Plains. To take the water out of the stream before it is subjected to these losses and to use it in the western portions of the Great Plains is to secure the maximum of benefit from this natural resource. Water which is passed on to Kansas is subject to conveyance losses from the causes mentioned. In addition there is the ever present likelihood that conditions of natural precipitation may be such in Kansas that when any given amount of water arrives there, it either cannot or will not be used. The needs of the crops are in many years satisfied by rain and require no water from the river. At such times the flow is permitted to pass unused out of the irrigated portion of the basin.

The use of this natural resource to obtain the greatest benefit therefrom can only result from a use at a point as near the headwater stretches as is possible. The irrigation requirements in Kansas can well be met through pumping projects. Indeed, these are recommended by the chief witness for Kansas (See App. A, pp. 104-105). When irrigation water is not an ever present necessity but merely an insurance against crop failure in times of natural deficiency, the use of ground water by means of pumps is to be preferred to the use of surface water through the means of ditches. The use of pumps imposes no burden upon the upstream ditches to forego the use of water which may not be needed when it has reached the downstream area.

Perhaps the most important factor in determining rights as between the upper and lower levels of the stream is priority of use. This has been long recognized by eminent authorities. Wiel in discussing the opposing rights of the upper and lower levels of a stream in his article "Fifty

Years of Water Law," 50 Harvard Law Review 252, 299-300 says:

> "The longer the time, the more weight priority must doubtless have in determining what is reasonable use; furthermore, water law has been disclosing new situations during these fifty years where it is necessary to give priority special prominence simply because other factors, although they may exist, fail to get into issue."

This question of priority of use runs directly contrary to the Kansas theory of equity of need.

In Colorado two years after the decision in *Kansas v. Colorado* there was an irrigated acreage in the Arkansas river basin of 464,236 acres and in 1939, 469,168 acres. In Kansas the figures for the same years in the five western counties where irrigation was practiced from the surface flows were 34,879 and 64,104 respectively. Colorado increased approximately 5,000 acres and Kansas approximately 30,000 acres. Kansas now says that it should receive water for the irrigation of additional land. We have shown elsewhere in this brief that to award to Kansas water for the irrigation of additional land is to impose on Colorado a curtailment of use and the resulting reduction in acreage. In support of their theory of equity of need Kansas says that there are 414,000 acres of irrigable land in the western portion of the basin in Kansas. Colorado Exhibit 196 (App. B, p. 50), shows that the United States Census Bureau reports that the irrigable area in enterprises in Colorado in 1940 was 672,627 acres and in Kansas was 127,950 acres. On their own theory, justified first on the basis of need for water, and second on the existence of land upon which water can be used, the rights of Kansas fall far below those of Colorado. *Colorado not only has greater need for the water but also has more land in existing enterprises upon which it can be used.*

(c) The Application of the Principle of Equitable Apportionment Does Not Require Any Precise Division of Water.

The Kansas argument is that since the two states have come to the Supreme Court of the United States with their dispute over the waters of this interstate stream, the Court will enter a decree of equitable apportionment. They assume the need for such a decree and they bluntly ask the Court to provide with "definiteness" for "adequate administration" (Kansas Brief, p. 45). The Court is a judicial not a legislative nor an administrative body. The Court may not write a compact for the states. This was pointed out in the 1907 decision when the Court, after remarking that Colorado could not be upheld in appropriating the entire flow of the river upon the ground that it was giving to Kansas something of equal value, said (206 U. S. 100):

> "That would be equivalent to this Court's making a contract between the two States, and that it is not authorized to do."

We pointed out in our opening brief that an effective decree of equitable apportionment requires the imposition upon the upstream state of some restriction or limitation. Kansas recognizes the validity of this argument. In that section of its brief, beginning on page 140 and headed "Why Enjoin Kansas?", the contention is made that the provisions of paragraph 9 of the Conclusions of Law and Paragraph 8 of the Recommended Decree should be modified by the elimination of any reference to Kansas. These two paragraphs purport to enjoin both Colorado and Kansas, and their officials and agents, from diverting and using water in excess of the amounts awarded to the states respectively. In support of its contention Kansas says (Brief, p. 141):

> "Water runs down hill, and Kansas never has or never will be able to use water in excess of any amount decreed by the Court as against the rights of Colorado. The shoe is on the other foot."

Colorado is a State of the Union and is on an equality with all other states. Any restriction or limitation upon its water uses is a restriction or limitation upon its quasi-sovereignty and, under the many decisions which we cited in our opening brief, will not be imposed in the absence of a showing by clear and convincing evidence of an existing or presently threatened injury of serious magnitude.

We direct attention to the fact that in the fourteen cases between states involving interstate waters this Court has granted relief in but three of them.[1]

In the Laramie river case the Court enjoined a transmountain diversion proposed by Colorado (*Wyoming v. Colorado*, 259 U. S. 419). In the Great Lakes Drainage case the Court limited diversions from Lake Michigan proposed by the Sanitary District of Chicago for the purpose of sewage disposal (*Wisconsin v. Illinois*, 278 U. S. 367, 281 U. S. 179). In the Delaware river case the Court enjoined transmountain diversions for domestic purposes in excess of stated amounts (*New Jersey v. New York*, 283 U. S. 336). In each case the action taken was to restrain a use which would take water away from the stream or lake and the justification for the action was the necessity to protect existing uses. In the Laramie river case the prior and existing irrigation uses were protected. In the Great Lakes Drainage case the purpose was the restoration of the navigable capacity of the Great Lakes to the former level. In the Delaware river case the safeguarding of the

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[1]The fourteen cases are: *South Carolina v. Georgia*, 93 U. S. 4 (obstruction to navigation); *Missouri v. Illinois*, 180 U. S. 208, 200 U. S. 496 (pollution from sewage); *Kansas v. Colorado*, 185 U. S. 125, 206 U. S. 46 (alleged wrongful diversions); *New York v. New Jersey*, 249 U. S. 202, 256 U. S. 496 (pollution from sewage); *Tennessee v. Arkansas*, 249 U. S. 588 (flood damage); *North Dakota v. Minnesota* and *South Dakota v. Minnesota*, 256 U. S. 220, 263 U. S. 365 (flood damage); *Wyoming v. Colorado*, 269 U. S. 419, 286 U. S. 494, 298 U. S. 573, 309 U. S. 572 (transbasin diversion); *Wisconsin v. Illinois*, 278 U. S. 367, 281 U. S. 179 (Great Lakes drainage); *Connecticut v. Massachusetts*, 282 U. S. 660 (transbasin diversion); *New Jersey v. New York*, 283 U. S. 336 (transbasin diversion); *Arizona v. California*, 283 U. S. 423 (validity of Colorado River Compact and Boulder Canyon Project Act); *Washington v. Oregon*, 297 U. S. 517 (alleged wrongful diversions); *Arizona v. California*, 298 U. S. 558 (apportionment of unappropriated waters).

fisheries and the recreational facilities along the stream required the limitation on the diversions. Thus in each case an injuction was granted against the taking of the water from its natural bed for use in another water shed and in each case the injunction was granted to protect prior uses.

The contrast between those three cases and that now presented to the Court is striking. Here Kansas is complaining, as it complained in the former suit, against long existing irrigation uses in Colorado. *These uses are all in the basin of the Arkansas river.* No new, different or unusual situation is mentioned either in the Kansas pleadings or evidence. Perhaps Kansas will challenge this statement upon the theory that Caddoa constitutes a threat. If it does the threat comes from the United States not Colorado. The dam was built by the United States Army after both Colorado and Kansas representatives had urged upon Congress the desirability of its construction. There can be no conservation storage unless an appropriation is made under Colorado law. There is nothing in the record to show that Colorado, or any of its citizens, is attempting, either directly or indirectly to obtain a storage priority for Caddoa.

Never has this Court undertaken to make a definite division of a water supply between states under circumstances such as are here presented. Never has the Court intimated that, if States fail to agree over the division of a water supply, they may rush to the Court and secure from it a formula which will be a cure-all for their administrative problems. Never has the Court imposed any restriction or limitation on the quasi-sovereignty of a state in the absence of a showing of serious injury to another state. Surely, if the vitality of the states is to be retained, the old rules should not now be either abrogated or relaxed. To grant relief, to decree an administrative scheme, or to adjudicate a cure-all for a social-economic problem every time states disagree among themselves is to destroy all incentive for that interstate cooperation which is essential to our federal system.

KANSAS HAS FAILED TO SUSTAIN THE BURDEN OF PROVING THAT THERE HAS BEEN A MATERIAL INCREASE IN THE DEPLETION OF THE STREAM BY COLORADO.

(a) The Theory That an Increase in Irrigated Acreage Indicates an Increase in Permanent Depletion of the Water Supply Is Fallacious.

The argument made at pages 68-73 of the defendants' brief is that the increase in the Colorado irrigated acreage establishes an increase in the permanent depletion of the stream in Colorado. The Colorado answer is that stream depletions are measured by the consumptive use of water (diversions less returns to the river) and are not measured by irrigated acreage.

First let us consider what has been the increase in irrigated acreage. The United States Census Bureau, which is the only agency that reports upon the question of acreages irrigated in all states under the same methods of definition and classification, gives the following statistics as to the Colorado irrigated acreage in the Arkansas river basin: 1902—300,115; 1909—464,236; 1939—469,168 (See App. A, p. 90). Thus the increase from 1909 to 1939 is less than 5,000 acres. Kansas makes much of the 1902 figure and bases its computations thereon. The answer to such an approach seems obvious. Kansas itself did not consider this increase sufficient to justifiy any action against Colorado and waited about twenty years, until it filed its cross-bill in this case, to assert any claim against Colorado. Surely if the increase from 1902 to 1909 had the effect which is now asserted the Kansas officials, who are presumed to do their duty, would have sued Colorado in 1909.

A second consideration is that an increase in irrigated acreage can take place, and in this instance has taken place, without any increase in stream depletion. This subject is discussed in detail in Appendix A to our opening brief, pp. 72-87, and we shall here merely note the responsible factors which are (1) increase in return flows resulting from the filling of the water table under the irrigated areas; (2)

improvements in the duty of water resulting from increased efficiency in the conveyance, application and use of water; (3) the construction of artificial drainage; and (4) the importations of water from other systems amounting to approximately 60,000 acre-feet in 1938.

For statistical proof of the Colorado position we refer to the table on page 33 of our opening brief. It is there shown that the average ditch diversions in the Pueblo to state line section for the period 1904-1911 was 906,000 acre-feet and for the period 1931-1940 was 787,000 acre-feet.

Colorado should be commended, not condemned, for making such a use of the limited water resource of the Arkansas basin that it has been able to increase its irrigated acreage without increasing its depletions of the stream flow. If the Kansas farmers were as resourceful and as efficient, they would make use of the large flow that now passes Garden City unused.

(b) The Meeker "Analytical Study" is Based Upon Estimates and Assumptions, is Thoroughly Discredited, and Does Not Constitute the Clear and Convincing Evidence Necessary to Justify a Decree Against a State.

The defendants rely upon the so-called "analytical study" of witness Ralph I. Meeker, a former employee of the state of Colorado,[8] to establish the fact that since the 1907 decision there has been an increase of stream depletion amounting to 300,000 acre-feet annually by Colorado (see defendants' brief, pp. 76-81 and insert of Kans. Ex. 70.) The asserted theory of the witness is that a comparison of years of comparable water supply shows the claimed depletion.

The methods used by the witness Meeker are discussed at pages 76-86 of Appendix A to our opening brief. We there showed the methods of estimation and assumption em-

[8] His employment was as Deputy State Engineer and was of a confidential nature (Tr. p. 1759). It continued for nearly a year after the bringing of this suit (Tr. p. 1832).

ployed and we pointed out that different methods were used for the period 1905-1911 than were used for the period 1912-1930, the two periods which the witness compared to arrive at the claimed increase of 300,000 acre-feet in stream depletion. Common sense and scientific reasoning both require that if estimated values are to be compared the same methods of estimation should be followed in determining the values to be compared. The most that can be said for the Meeker study is that it displays a remarkable mathematical ingenuity.[9]

The defendants have reproduced Kansas Exhibit 70 and inserted it at page 76 of their brief. So much reliance is placed on this complex and bewildering exhibit, and the Meeker testimony based thereon and in explanation thereof, that we are inserting as Appendix C to this brief a critical analysis and a reproduction of certain of the cross-examination of Mr. Meeker. It is sufficient to point out here that in making his assumptions of water supply the witness disregarded the records as to precipitation at the numerous weather bureau stations throughout the basin. Precipitation is the source of the water supply. Except for extraordinary climatic disturbances of a purely local nature, the water supply must and does vary with the precipitation over the basin. The failure of the witness to correlate his total water figures for each year with the precipitation for that year is alone sufficient reason for disregarding the highly theoretical "analytical study."

Upon the basis of the Meeker study the flat statement is made on page 81 of the Kansas brief that "since the close of testimony in the original Kansas-Colorado suit the consumption of water in Colorado has increased to the extent of 300,000 acre-feet of the average yearly dependable

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[9] The effectiveness of the Meeker evidence is materially weakened, if not entirely destroyed, by his statements on cross-examination that the diversion records show no material change in Colorado diversions since 1905, that if acreage in Colorado has expanded under the ditches on the main stem, it has done so because of an improved duty of water, that during the period the river gains due to return seepage have increased, that the consumptive use of water has declined, and that relatively the stream flows have improved (Tr. p. 1936).

supply." The statement will not stand any critical analysis. The parties appear to be in agreement that the average annual state line flow for the period 1908-1938 was 260,700 acre-feet. If the average depletion was 300,000 the average earlier flow would have been that much greater or 560,700 acre-feet. Yet Kansas Exhibit 70 gives the following 5-year means for the Holly outflow:

Years	Outflow in Acre-Feet
1895-1899	300,000
1900-1904	470,000
1905-1909	454,000
1910-1914	236,000
1915-1919	198,000
1920-1924	476,000
1925-1929	272,000

It will be remembered that the values prior to 1908 shown on Kansas Exhibit 70 for the Holly outflow were estimated, not measured, values. Even on the Kansas estimates it is clear that an increased depletion of 300,000 acre-feet annually could not and did not take place.

The records of Colorado consumption (Tables 3b and 3c, pp. 77, 78, App. A), the records of Colorado ditch diversions (Tables 3c, 4 and 5, pp. 77-82, App. A), the records of total, divertible and usable state line flows (Colo. Exs. 209, 211, 214, 215, pp. 61-67, App. B), all prove the falsity of the Kansas claim that there has been an increase of 300,000 acre-feet on an annual average in the Colorado depletions since the former decision.

Finally, we direct attention to the fact that this assertion of an increased depletion averaging 300,000 acre-feet annually is a repudiation of the position taken by Kansas in the former suit. In 1901 Kansas pleaded that Colorado had totally destroyed the normal flow of the river exclusive of floods (206 U. S. 52-53). Now Kansas says that the flow at the time of the former suit was such that Colorado has been able to deplete it on an annual average of 300,000 acre-feet. It is remembered that the average state line flow (1908-1938) was 260,700. Hence if Kansas is now correct, the flow, which in 1901 was destroyed, actually amounted to

560,700. The obvious contradiction casts a cloud both upon the reliability of the Kansas evidence and the sincerity of the Kansas position.

(c) The Attempted Showing That Colorado Reservoir Storage Has Deprived Kansas of Usable State Line Flows Is Inconclusive.

At pages 101 to 108 of their brief the defendants attempt to show that Kansas has been deprived of water by storage in Colorado. On page 105 is a table, one column of which contains an enumeration of the number of days during the summer period of the years 1912 to 1931 inclusive when the state line flow was less than 200 c. f. s. On the following page is a table purporting to show the net gain in Colorado storage during the months of May, June, July and August during the years 1926 to 1932 inclusive. The point which opposing counsel seek to make from these tables is that Colorado by storing water during the summer months has decreased the supply available for irrigation in Kansas during the same months. If it is borne in mind that Kansas can only be affected by a decline in divertible state line flows, the fallacy of the argument is at once apparent. There is no showing anywhere in the Kansas brief or evidence that the amounts of water stored consisted of anything but flood spurts which, if not stored, would have passed out of the irrigation portion of the basin unused.

The conservation storage of both flood waters and winter flows is both desirable and proper. By such a practice the greatest beneficial use of a limited water resource is obtained. Evaporation losses which are emphasized on page 101 of the Kansas brief are unimportant in the overall picture as they represent water which would have been unused in any event.

The showing that in a certain month or year the stream flow at the state line was less than 200 c. f. s. for a certain number of days while during the same year or month Colorado storage increased a certain amount does not prove any depletion in divertible state line flows. It is

more reasonable to assume that the storage took place in times of flood than otherwise. The Colorado storage rights are inferior to all important Colorado direct flow rights. The Kansas theory requires the assumption that Colorado owners of direct flow rights are going to forego their uses in order to permit the accumulation of storage. Such unselfish benevolence is not common.

In any event the Kansas theory is exploded by the recorded statistics which, as we have pointed out again and again, show an increase in divertible state line flows since the former decision (See Colo. Ex. 211, p. 63, Appendix B).

(d) The Variability of the State Line Flow Does Not Prove Any Increase in Stream Flow Depletion.

The brief of the defendants (pp. 81 to 100) attempts to make much of the variable character of the state line flow. They submit three hydrographs and many tables in an endeavor to bolster their claim of stream depletion. All this effort may be summarized by the statement that there is extreme variability in the state line flow. This, we freely admit. *The point is that nowhere in argument or evidence has Kansas made any showing that this variability is any greater now than it was at the time of the former decision.*

In 1907 this Court said (206 U. S. 115):

> "That there is a great variance in the amount of water flowing down the channel at different seasons of the year and in different years is undoubted; that at times the *entire bed of the channel has been in places dry* is evident from the testimony."

In 1943 the Master found (Report p. 5):

> "The character of the flow of the river in Colorado is variable from year to year and season to season and day to day, and the main river at any one point may be almost without water one day and have a flood in it the next day and the following day have practically its original condition."

Kansas has taken no exception to the above quoted finding of the Master.

When Kansas complains of the variable state line flow, it complains of a condition produced by nature, not a condition produced by Colorado.

If there is any doubt about the conditions of stream flow prior to the former decision it should be dispelled by the statement of the United States Census Bureau report for 1900 wherein, with reference to the Kansas irrigation ditches, it was said (Tr. pp. 3506-3507, App. A, pp. 109-110):

> "The water supply for most of these ditches was to have been taken from the Arkansas river, but it proved wholly inadequate for that purpose, and hundreds of miles of ditches had to be abandoned. The principal irrigated areas are along this river, where the conditions are somewhat similar to those along the Platte river in Nebraska. *Its broad shallow channel is dry for a considerable part of the year;* water, however, is seeping beneath the surface of the valley lands, as well as under the stream bed. The ditches operated at the present time can receive water only at times of flood, and are utilized largely in the cultivation of forage crops."

Kansas, while it attempts to make much of the variable character of the state line flows has by its own evidence shown that there has been an increase in divertible state line flows. We refer to Kansas Exhibit 70 which has been reproduced in the Kansas brief (p. 76). The graph at the top of this exhibit shows in solid black "water divertible-Kansas canals April to October." In the twelve years 1895 to 1906 inclusive, divertible water is shown to have been present only in two years, 1903 and 1905. In the twenty-four-year period 1907-1930 divertible water is present in at least eighteen of the years. Thus the Kansas evidence sustains the Colorado showing (Colo. Ex. 211, App. B, p. 63) that the divertible state line flows have increased. It is not necessary to pursue the inquiry further.

KANSAS HAS FAILED TO SUSTAIN THE BURDEN OF PROVING THAT THERE HAS BEEN AN INJURY TO ITS SUBSTANTIAL INTERESTS BY REASON OF ANY INCREASE IN STREAM FLOW DEPLETION BY COLORADO SINCE THE FORMER DECISION.

(a) An Increase by Colorado in Stream Depletion Does Not Require an Affirmative Decree of Equitable Apportionment Unless There Is a Resulting Injury to the Substantial Interests of Kansas.

It will be recalled that the Court in its direction for the entry of a decree in 1907 specifically said that the Kansas bill was dismissed without prejudice to the right of Kansas to institute new proceedings when because of a material increase in stream flow depletion by Colorado, the substantial interests of Kansas are injured to the extent of destroying the equitable apportionment of benefits between the two states resulting from the flow of the river. Hence in order for Kansas to avoid the application of the rule of *res adjudicata* it must show such an injury to its substantial interests as destroys the equitable apportionment between the states. By its dismissal of the Kansas bill in 1907 the Court necessarily held that nothing which Colorado had done up to that time had destroyed the equitable apportionment.

(b) The Kansas Showing of Irrigable Land Which Might Have Been Irrigated Except for Stream Depletion by Colorado Is Not a Showing of Injury to Its Substantial Interests.

The only showing of injury which Kansas attempts to make is that there is in the western counties of the state irrigable land, the development of which (Brief, pp. 64-65) "undoubtedly could and would have taken place except for Colorado diversions."

Nowhere in the record, in the Master's report, in the Kansas Exceptions or in the Kansas Brief, is there any claim that any Kansas enterprise, dependent upon the use of water of the Arkansas river, is in any worse condition now than it was in 1907. Since the position taken by Kansas in its pleadings, in its evidence, and in its brief is that

the case involves the need of Kansas for water for irrigation purposes, it is unnecessary to discuss domestic or industrial uses. The issue is limited by Kansas itself to irrigation requirements. It follows that for Kansas to make a showing of injury to its substantial interests it must, in order to maintain its cross-bill, establish by clear and convincing evidence that since the 1907 decision the Kansas farmers have been deprived of irrigation water which they formerly used. On this proposition the increase in the Kansas irrigated acreage from 34,879 acres in the five counties wherein irrigation from the surface flows of the Arkansas river is practiced in 1909, to 64,104 acres for the same five counties in 1939, and the increase in Kansas ditch diversions from a calculated average of 59,200 for the period 1908 to 1913 inclusive to an average of 99,100 in the period 1933 to 1938 inclusive indicate beyond the shadow of a doubt that instead of any harm having resulted since 1907 there has been a definite and substantial improvement.

Whatever irrigable land there is now was also in existence in 1907. There is no showing of any change in this regard. Obviously there could be none. The character of the soil and the nature of the topography are fixed.

All that Kansas can possibly claim is a speculative injury. Their argument that if Colorado had not used the water they would have used it did not entitle Kansas to relief in 1907, and should not be recognized when it is reasserted thirty-six years later.

THE MASTER'S RECOMMENDATIONS AND THE MODIFICATIONS REQUESTED BY KANSAS ARE INEQUITABLE AND UNFAIR TO COLORADO.

(a) Kansas Agrees with Colorado That the Master's Recommendations Are Ambiguous and Uncertain.

In our opening brief we pointed out at some length the ambiguity and uncertainty of the Master's Findings of Fact, Conclusions of Law and Recommended Decree. In its brief Kansas admits in several places, as for example

page 144, that the Master's report is ambiguous and uncertain. The difference between the position of the parties is that Kansas accepts the basic findings and conclusions of the Master and directs its exceptions to such revision and modification thereof as will further the Kansas interests. Colorado says that the nature of the report is such that it is impossible to rewrite it so as to make it either fair to both states or workable.

(b) The Changes Requested by Kansas.

As indicated by the Kansas exceptions and brief, Kansas does not object to the division of what is called the dependable water supply upon the basis of 185,000, or one-sixth to Kansas, and 925,000 acre-feet, or five-sixths to Colorado. The Kansas contention is that provisions should be inserted which would define the Kansas share as 30.87% of the water as it accrues day by day at the Canon City and Purgatoire gauging stations. This water, they say, should be delivered to Kansas when and as required by the Kansas officials. Water crossing the state line in excess of either the daily accruals to the Kansas account or the demands of the Kansas officials should not be charged to Kansas.

The gross inequity to Colorado of a decree embodying such modifications and revisions of the Master's Recommendation is obvious. In the first place we repeat again that Kansas is not entitled to a regulated water supply. It did not have that in the days before irrigation. Certainly there is nothing in the relationship of the states of our Federal Union which requires an upper state to give a lower state an advantage which it would not have in a condition of nature. In the second place the idea of delivering upon demand water which accrues day by day is self-contradictory and impossible of performance. In the third place to award to Kansas a percentage of the water as it accrues day by day at stations many miles above the state line without any charge upon Kansas for conveyance losses is to impose upon Colorado the wholly unfair and inequitable burden of standing all losses of water resulting from

such natural causes as evaporation, transpiration and percolation.[10] In the fourth place at the time of the former decision Kansas was not using and probably would not use now if it could receive the amount of water for which the defendants ask. In the fifth place delivery only upon demand by the Kansas water officials would enable Kansas to time its demands so as to receive without debit against its allocated share practically all of the stream accretions between Caddoa and the state line, amounting on an annual average of 123,900 acre-feet (App. A. p. 147) as the Colorado ditches can make little or no use of these accretions which largely enter the stream below the Colorado ditch headgates. Finally, to allot to Kansas any such amount of water is to curtail Colorado's uses which have existed for many years and which were in existence at the time of the former decision.

(c) The Master Did Not Recommend That Kansas Is Entitled to 30.87% of the Index Flows.

The theory of Kansas is that the Master intended that Kansas should receive 30.87% of the combined flow at the Canon City and Purgatoire gauging stations. There is nothing in the report of the Master which justifies this position. The Master merely found that Kansas was entitled to one-sixth of what he deemed the dependable water supply. The Master recognized that this supply varied from year to year and that the 185,000 acre-feet, which he considered to be Kansas' share in the average year, should fluctuate with the water supply. It is true that the Master provided for two index stations, but he did not at any place in his report provide for any allocation except on a one-sixth basis. It is a reasonable inference that his intent was to award to Kansas one-sixth of the index flows. Certain it is that he never used the percentage of 30.87, and

[10] Attention is directed to the testimony of Kansas, witness Meeker (Tr. p. 2039) that, "In order to deliver comparatively small volumes of direct flow water for irrigation on the lower end of such rivers—that refers to the Arkansas, South Platte, North Platte and Rio Grande—to relatively small areas, large volumes of water are, and would be, required to satisfy channel losses."

recommended no formula for the ascertainment of any percentage other than 16.67%, or one-sixth.

Kansas bases its claim to 30.87% of the index flow upon the theory that the combined flow of the index stations, amounting to 670,380 in the period 1908 to 1938, represents 54% of the average annual water supply of the basin found by the Master to amount to 1,240,000 acre-feet (Brief, p. 129). They then relate 16.67% to 54% and come out with the answer 30.87% as the figure which should determine the Kansas share. They have no explanation for the use of the figure 1,240,000 acre-feet, which the Master finds to be the average annual water supply, instead of 1,110,000 acre-feet, which the Master finds to be the average dependable water supply. In this connection we again point out that *there is no possible way of measuring either the total average annual water supply or the total average annual dependable water supply.* One thing is certain however; if there is any dependable water supply in the Arkansas basin it is the water which passes these two gauging stations. Hence, if any credence whatever is to be given to the Kansas theory, the figure for the average annual dependable supply should be used in determining the relationship rather than the figure for the average annual total supply.

(d) Any Decree Awarding to Kansas a Percentage of the Index Flows and Having the Effect of Impairing Early Colorado Priorities Would Violate Colorado's Right to an Equitable Apportionment of Stream Flow.

The Kansas argument is that an award of 30.87% of the index flows will give to Kansas the 185,000 acre-feet which the Master says represents the Kansas portion of the average annual dependable supply. This statement is incorrect. Kansas has used in its own exhibit (Kans. Ex. 134, App. B, page 73) and in its brief (pp. 128-129) the figure of 670,380 acre-feet as the average annual flow of the combined index stations. 30.87% of 670,380 acre-feet is 206,946 acre-feet, or more than 21,900 acre-feet in excess of the Master's recommendation.

Kansas seeks to appear magnanimous by asserting (brief pp. 47-48) that it is willing to accept the allocation of 185,000 acre-feet even though this is less than the average of 260,700 acre-feet which was the annual average amount crossing the state line in the period 1908 to 1938, and it says that it has not excepted to this small apportionment because it is the manifest intent of the report that water be delivered "in accordance with irrigation needs and upon the demands of the state water officials." We deny that such is the intent of the report. Nowhere in the report is there any provision requiring a delivery by Colorado on demand. The language used with reference to the 35,000 acre-feet of winter flow is "as the same could be delivered for irrigation or storage when required by the water officials of Kansas." (Master's report, Findings of Fact, Paragraph Nine, Conclusions of Law, Paragraph Three). The language in the decree, which we insist applies only to the winter water and which would conflict with the Findings of Fact and Conclusions of Law if applied to both summer and winter water is this, "at such times and in such amounts as and when required by water officials of the State of Kansas." The term "as and when required" carries with it the meaning that the water must be reasonably needed for irrigation purposes. The term "demand" eliminates the element of need.

It must be remembered that the figure of 260,700 is an average figure arrived at by taking into consideration all state line flows including all floods. If in arriving at the average the unusually large stream flows occurring in the years 1914, 1915, 1921 and 1923 are excluded, the average state line flow would be 194,400 acre-feet annually, divided into 116,500 acre-feet of April-September flow, and 77,900 acre-feet of October-March flow. The Master proposes that Kansas be awarded 150,000 acre-feet of summer water, or 33,500 acre-feet in excess of the average state line flow if the four large water years are excluded. (The above computations are from Colo. Ex. 204, App. B, pp. 54-58).

If we assume for the sake of argument that it was the intent of the Master to require Colorado to deliver water as

and when required at the state line, the assumption least harmful to Colorado would be that Kansas would be chargeable with all divertible state line flows.[11] If the four high water years above noted are eliminated in computing the average state line flows and if also the non-divertible state line flows are excluded from the accounting, the computation shows the average divertible state line flow to be 143,800 acre-feet, divided into 81,400 of summer flow and 62,400 acre-feet of winter flow; thus there will be a deficiency under these conditions of 68,600 acre-feet in Colorado's ability to meet the summer requirements proposed by the Master. This amount of water can only be secured by the curtailment of Colorado uses long existing prior to 1895. Considered in the light of these figures the magnanimity of Kansas is easily understandable.

In every case such as this there is an ever present tendency to become so involved in the great mass of statistics that it is difficult to see the answer. Hence, it may be well to appraise the situation from the standpoint of the common farmer who is vitally concerned with securing water for the irrigation of his crops and who knows little, if anything, about engineering analytical studies or legal imponderables. To the man who works with a shovel turning water from an irrigation ditch into his fields, there is one salient and unforgetable feature of the Master's report. The Master finds that in Colorado there are approximately 470,000 irrigated acres in the basin and in Kansas approximately 65,000; yet he gives to Colorado 925,000 acre-feet of water on an annual average, or less than 2 acre-feet per acre, while he gives to Kansas 185,000 acre-feet, or more than 2.8 acre-feet per acre. The farmer looks at these figures of acreage and water, makes the simple comparison, realizes that the need for water is less in Kansas than it is in Colorado and then sends forth his sincere complaint that Colorado has been ill treated. There is merit in this simple method of approach.

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[11] By divertible state line flows we mean flows within the diversion capacity of the existing Kansas ditches which is approximately 2,000 second feet. This use of the term divertible corresponds with the definition of the term found on page 85 of the Kansas brief.

In this connection it is well to bear in mind the admission of Kansas counsel on page 27 of their brief that in the Kansas area between the state line and Garden City there were in 1939 only 29,239 acres maintaining irrigation without the use of supplemental water secured from pumping plants. Colorado Exhibit 135, an excerpt from United States Department of Agriculture Technical Bulletin 36, shows that the seasonal net irrigation requirement in acre-feet per acre for western Kansas is 1.75. Upon this basis the 29,239 acres of Kansas land which depend solely upon surface flows require 51,165 acre-feet of water annually.[12]

Water to recharge the ground storage can and does occur at irregular intervals, frequently as floods, and is not needed upon any basis of when and as required. It cannot be denied that the historical winter flows have always been large enough to recharge the ground storage. (See statement of Kansas witness Knapp quoted on pages 107-108, Appendix A).

These factors which we have just mentioned, and others which appear in our former brief and appendices, make it clear that any award to Kansas of the amounts claimed by that state can only be justified upon the ground that, if they are obtained, additional land will be irrigated. *If additional land is not irrigated, then the water will pass out of the basin unused and Colorado will have suffered a grievous detriment without there being any benefit whatsoever to Kansas.* If additional lands are put into irrigation in Kansas to use these additional amounts of water, then what will have taken place will be a reshuffling of the economic civilization which now exists in the Arkansas valley. Colorado has had for over fifty years the facilities necessary to put to beneficial use all this water which Kansas would now take away. Facilities for the use of such large additional amounts do not exist in Kansas. *There is no assurance that they will ever be constructed in Kansas and*

[12] This figure approximates the 52,000 acre-feet figure for summer delivery fixed by the Stipulation of 1933 (Colo. Ex. 179, App. B, pp. 30-35).

there is no certainty that if they are constructed the Kansas farmer will use them. The most that can be said is that there will be a possible benefiit to Kansas if its farmers will use additional water. Thus the proposition of taking water away from existing uses in Colorado is predicated upon a foundation of doubt, speculation and conjecture.

(e) The Kansas Proposals Would Destroy the Irrigation Development of the Arkansas Valley in Colorado Below Canon City.

We have shown in our opening brief and in the argument just presented herein that the Kansas proposals could only be satisfied by the curtailment of Colorado uses. Now we desire to point out just how disastrous their effect, if adopted, will be. Kansas by its Exception Nine, and argument in support thereof, urges that the Master's Finding of Fact Nine and Conclusion of Law Three "should be made to conform to Paragraph Two of the proposed decree in order that the delivery of *all* of the water allocated to Kansas should be made when and as required by the water officials of the State of Kansas." (Kansas Brief, p. 39).

If this language, or any similar language, is inserted into the decree then disaster has come to the Colorado portion of the Arkansas river basin. A civilization will be wiped out more thoroughly than if a great air armada had bombed every city, town, farmhouse, reservoir and irrigation ditch. This is not idle talk nor an appeal for sympathy. It is a cold hard fact.

We need not again call attention to the fact that a water supply of extreme variation cannot be delivered on demand. We need not again direct attention to the inconsistency of the Kansas position which seeks both an award of the percentage of the index flows as they accrue day by day and the delivery of the amounts of water so determined as and when required. We need not again refer to the enormous losses between Canon City and the state line in the channel of the Arkansas river which was aptly characterized in the former case as a "sieve" (206 U. S. 52-53).

The records show, and the facts cannot be disputed, that in every year in many months there are large and important canals in eastern Colorado such as the Fort Bent, the Amity, the Catlin and others with very early priorities which are diverting no water from the river whatsoever because there is none there, although there is often a substantial quantity flowing past Canon City.

A comparison of the Colorado priorities along the main stem of the river with the stream flows will indicate the problem. The following table compiled from Kansas Exhibit 2 shows the priorities:

PRIORITIES OF PRINCIPAL ARKANSAS RIVER DITCHES—CANON CITY TO STATELINE

Ditches (Downstream Order) Canon City (G.S.)(a)	Senior to 1884	Year 1884	Years 1885-86	Year 1887	Years 1888-89	Years 1890-91	Years 1892-95	Totals*
Canon City and Oil Cr.	24.73							24.73
Fremont County	17.00							17.00
Union	48.00							48.00
Ark. Val. Conduit	70.00							70.00
Bessemer	70.65			318.00				388.65
West Pueblo	3.20			15.00				18.20
City Pueblo (N.S.)	25.53							25.53
City Pueblo (S.S.)	27.77							27.77
Sum to Pueblo	286.88			333.00				619.88
Booth	18.00				2.10		10.20	30.30
Excelsior				20.00		40.00		60.00
Collier				26.00				26.00
Colorado						756.28		756.28
Hiline	56.60		32.00			380.50		469.10
Oxford	13.40			116.00				129.40
Otero						123.00		123.00
Catlin	22.00	226.00		97.00				345.00
Holbrook					155.00		445.00	600.00
Rocky Ford	111.76					96.54		208.30
Ft. Lyon		164.64		597.16			171.20	933.00
Jones	22.30	27.50			80.00			129.80
Town		32.50						32.50
Sum (Pueblo-Caddoa)	244.06	450.64	32.00	856.16	237.10	1396.32	626.40	3842.68
Sum (C.C.-Caddoa)	530.94	450.64	32.00	1189.16	237.10	1396.32	626.40	4462.56
Keesee	13.50						15.00	28.50
Ft. Bent			27.77		44.47	26.27	50.00	148.51
Amity				283.50			500.00	783.50
Lamar	15.75		72.09	13.64		184.27		285.75
Hyde				23.44				23.44
Manvel						54.00		54.00
Graham						61.00		61.00
X. Y.					69.00			69.00
Buffalo			67.50					67.50
Sisson					6.85	18.00	7.20	32.05
Sum (Caddoa-Stateline)	29.25		167.36	320.58	120.32	343.54	572.20	1553.25
Total (C.C.-Stateline)	560.19	450.64	199.36	1509.74	357.42	1739.86	1198.60	6015.81

(a) Exclusive of priorities diverted above Canon City (G.S.): C.C. Pipeline 22.50—1863-64; C.C. Hyd. and Irr. 77.00—1866; and South Canon 43.51—1866-82.

*Exclusive of subsequent enlargement priorities: Ft. Bent 80.00—1900; Otero 334.92—1903 and Jones 44.80—1909; there are no others.

In the next table the priorities are assembled chronologically first for the Canon City to Caddoa section and next for the Caddoa state line section:

COLORADO PRIORITIES FROM MAIN RIVER CANON CITY TO CADDOA
(Values in Second Feet)

Priority	Amount	Combined Total
Senior to 1884	530.94	
1884	450.64	981.58
1885-1886	32.00	1,013.58
1887	1,189.16	2,202.74
1888-1889	237.10	2,439.84
1890-1891	1,396.32	3,836.16
1892-1895	626.40	4,462.56

COLORADO PRIORITIES FROM MAIN RIVER CADDOA TO STATE LINE

Priority	Amount	Combined Total
Senior to 1884	29.25	
1884-1886	167.36	196.61
1887	320.58	517.19
1888-1889	120.32	637.51
1890-1891	343.54	981.05
1892-1895	572.20	1,553.25

Consider now the stream flows. The following table compiled from Colorado Exhibit 204 shows the average daily flows during the six summer months in cubic feet per second at the two proposed index stations, the total and the amount required at the state line to satisfy the Kansas pro-

posal without any regard to an as and when required delivery:

Month	Canon City	Purgatoire	Total	30.87% of Total
April	401	99	500	154
May	1,050	198	1,248	385
June	2,197	204	2,401	741
July	1,446	318	1,764	544
August	882	393	1,275	396
September	495	145	640	199

It thus appears that, during the month of the greatest average flow at Canon City, the flow (2,197 c. f. s.) is insufficient to satisfy Colorado priorities in the Canon City to Caddoa section dated 1887 or earlier (2,202.74 c. f. s.).

Likewise during the month of the greatest average Purgatoire flow (393 c. f. s.) the Colorado priorities in the section Caddoa to state line dated in or prior to 1887 and amounting to 517.19 c. f. s. cannot be satisfied.

If these flows are further reduced, their inadequacy to satisfy Colorado rights under 1887 or earlier priorities is greatly increased. If in addition the Kansas deliveries are on a demand basis, the inadequacy of the flows is such that rights dated prior to 1884 would undoubtedly be affected, but it is impossible to compute the amount because it is impossible to guess what whims may motivate the Kansas officials in asserting the rights of the lower state. To make any explanation of the possible result it is necessary to speculate. Let us assume a month in which it rains during the first fifteen days with the result that Kansas would not demand any water and let us assume further that the daily average flow for the month at Canon City is 1,500 c. f. s. In this situation the water then flowing across the state line would not be counted. For the last sixteen days of the month Kansas officials might demand that Colorado deliver to the state line a continuous daily flow of 900 c. f. s. (This amount would be necessary to meet the monthly quota if no water were charged for the first half of the month). In such a situation the headgate of probably every Colorado ditch from Canon City to the state line would be closed, and it is doubtful whether or not Kansas

would even then obtain more than a fraction of such a flow. It is obvious that Kansas could manipulate its demands so as to impose unbearable hardships on Colorado. Whenever there are rains in Kansas, whenever there are floods down the tributaries entering the stream in eastern Colorado, Kansas will stop demanding water and none of the state line flows could, under the defendants' theory, then be charged to it. Meanwhile the rights to the water accruing day by day at the index stations would build up to such an extent that when the demand would finally be made it would be impossible of satisfaction.

Kansas' proposal would so disrupt the administration of the river in Colorado as to cause the utmost chaos, confusion and injustice. Suppose 1,500 c. f. s. were in the river at Canon City on a given August 1. It would require four or five days for any portion of that water to reach the state line.[13] Yet Kansas might well say that it had a right to demand an immediate delivery of 30%, or 450 c. f. s. Assuming that on the same day the flow of the river at La Junta was 200 c. f. s., to supply the Kansas demand every headgate between La Junta and the state line would have to be closed and Kansas still would be short. On the other hand assume that Kansas would wait until August 4th to make its demand. In the meantime Colorado ditches would have taken their full priorities with the result that when Kansas demanded the water the lower Colorado ditches would have to be curtailed in their use or shut down entirely to supply the accumulated Kansas demands. Under such a condition the upper Colorado ditches would be supplied in full and the lower ditches would receive nothing as a result of the whims of Kansas water officials.

Under such a situation no man with the ability to operate a farm successfully would want to own a farm dependent upon the use of Arkansas river water for irrigation in Colorado. It is a fair prophecy that if the Kansas proposals are put into effect the first result will be the institution in Colorado of as many law suits as the resources of the farmers will permit. As a result of this litigation

[13] See testimony of Witness Meeker (Tr. p. 1808).

perhaps one or two ditches with old water rights will obtain a preferential position that will enable them to irrigate some of their present acreage. The rest of the Colorado irrigated land in this basin will go back to sage brush and cactus.

The difficulty of carrying out a required delivery schedule from Colorado were admitted by Kansas witness Meeker. Such a requirement would necessitate curtailing Colorado uses and providing a burden of storage and would be almost impossible under the variations of the flow of the river. (Tr. pp. 2088, 2093, 2096 and 2097).

(f) A Common Sense Approach to a Decree of Equitable Apportionment Requires That Before Any Such Decree Be Entered a Careful Analysis Be Made to Determine Its Probable Effect.

It is not being merely oratorical to say that the future of the Arkansas valley is at stake in this case. Colorado has full confidence in its position that no decree should be entered attempting to define for all times the rights of the two states. We would be somewhat less than frank if we failed to recognize the possibility that the Court might not agree with us. If such is the case and there is to be a decree attempting to define with precision the quantum of water to which each state is entitled, then, if a real equitable apportionment is to be made, it is absolutely necessary that a competent engineering study be made to determine how the decree will operate. If such a study is not made, then the use of an important natural resource is being determined without proper regard for the available means of knowledge.

The Master's recommended apportionment is not justified by anything which appears in the record in this case. Neither party proposed it. No expert irrigationist testified how such a division of the water supply will affect the two states.

Colorado started this litigation for the purpose of ending the harassment of the private litigation. Kansas by its

cross-bill sought an equitable apportionment and prayed for a decree defining "the rights of residents and citizens of Kansas to divert water from the Arkansas river for the purpose of agricultural irrigation of lands in Kansas • • • in second feet." (Kansas Answer p. 47). In the first few years of the taking of testimony the evidence of Kansas related to the proof of priorities, apparently designed in support of a schedule of interstate priorities regardless of state lines. Later the Kansas witnesses Meeker and Knapp gave their engineering testimony apparently in support of the theory that Kansas be awarded an annual amount of water in terms of acre-feet. It was not until the final hearing before the Master that there was any suggestion of index stations. The Kansas witness Knapp presented Kansas' Exhibit 134 showing the combined flow at the Canon City and Purgatoire stations for the period 1908 to 1938 and suggested that Kansas be given 50% of this combined flow. His testimony as to this division was nullified by his admission under cross examination that the present Kansas ditch diversions constitute about 13.5% of the flow of the two stations which he suggests as an index (Tr. p. 7070-7071). Except for this evidence of Mr. Knapp there is nothing said in the long record about a decree giving to Kansas any percentage of any index flows. There being no such evidence and there being no such claim asserted by Kansas there was, of course, no evidence as to how any such division might affect the two states. Now the Master recommends a divison suggested by neither party and Kansas by its exceptions seeks modifications of the Master's recommendation which were never even dreamed of when the evidence was being introduced.

In our opening brief we showed that the obligation for Colorado to deliver 27.6% of the index flows to Kansas at the state line would require, under historical conditions, a curtailment of Colorado uses in excess of 44,000 acre-feet annually, even though Kansas were chargeable with all water crossing the state line up to the seasonal delivery obligation. It is obvious that if the percentage is increased to 30.87% as contended by Kansas and if any limitations

whatsoever are placed upon the flows chargeable to Kansas, then the curtailment of Colorado uses will be increased to an extent which cannot now be forecast.

A case of the importance of this should be determined upon the basis of knowledge, not upon the basis of guess.

(g) Administration to Protect Colorado Is Just As Important and Necessary As Administration to Protect Kansas.

The defendants argue at pages 45-56, 120 and elsewhere in their brief that, if delivery to Kansas is to be protected, Colorado uses must be placed under a definite and clear administrative restraint. It is of equal importance that no administrative regulation be adopted which will have the effect of compelling a curtailment of Colorado use and not assuring that a commensurate benefit will result in Kansas.

Kansas protests at great length that since Colorado is the upper state and has the first opportunity to use the water, it can deprive the Kansas area of all water unless appropriate restrictive measures are decreed. A proper consideration of the interstate equities requires recognition of the fact that water which flows out of the irrigated section of the basin is gone forever and cannot be turned around and brought back upstream. Shortage of water makes the elimination of waste imperative (*Burley Irrigation District v. Ickes*, 116 Fed. (2d) 529, 535). There is obviously no point in depriving the Colorado ditches of the right to use water unless there is reasonable assurance that such water will be used in Kansas. Once the water passes the Colorado headgates it is forever lost to them. Yet when such water which might be used to save a Colorado farmer's crop gets down into Kansas, it may not there be used either because of lack of development of land upon which it could be used, the fact of additional precipitation in Kansas making it unnecessary to be used, or the failure of the Kansas farmers to pay for irrigation projects, an attitude which they have assumed in the past.

This Court said in its 1907 decision (206 U. S. 109) that

"before * * * this effective cause of Colorado's development is destroyed or materially interfered with, it should be clear that such sister state has not merely some technical right, but also a right with a corresponding benefit." All that Kansas has attempted to show in this case is the same technical right which did not entitle it to relief in 1907. The Master's report clearly recognized (Findings of Fact, Paragraph Nine, Conclusions of Law, Paragraph Three), that the amount of water which he proposes to allocate to Kansas is not only for lands now being irrigated but also for lands to be irrigated in the future. A Court cannot bring about the irrigation of any lands by the mere entry of a decree any more than it can predetermine sovereign rights (see *U. S. v. Appalachian Electric Power Co.*, 311 U. S. 377, 423). Of necessity there can be no assurance that any additional lands whatsoever will be irrigated in Kansas no matter how great the curtailment of the existing Colorado uses; hence it is just as important to protect the Colorado uses from the wasting out of the irrigated area of water which the Colorado ditches could use as it is to protect the Kansas ditches from the alleged inequitable uses in Colorado. The evidence in this case shows that the protection of the Colorado uses is even more important. There has been no denial of the testimony of Colorado witness Patterson that in the period 1908 to 1938, 85,000 acre-feet of divertible water on an annual average flowed unused past Garden City. *Since Kansas is not now making full use of the resources which it has, there is no reason to expect that in the future it will use more water even if it gets it.*

IRRIGATION IN KANSAS.

The defendant's brief does not paint a true picture of irrigation in Kansas. At pages 21-22 there is a discussion of certain Kansas statutes allegedly providing for appropriative uses of water. No reference is made to the decision of the Kansas Supreme Court in the case of *Frizell v. Bindley*, 144 Kans. 84, 85 Pac. (2d) 95, wherein it was held that the Kansas statute of 1886 cannot be constitutionally applied in derogation of the common law riparian rights

attached to land patented prior to the enactment of the statute.

Attention is here directed to the following allegation made by Kansas in the former suit (206 U. S. 50-51):

> "That by the year 1868 the land in the Arkansas valley began to be taken by actual settlers, and by the year 1875 practically all the bottom lands in the east or lower half of the valley were entered and settled, and title obtained from the United States or the State of Kansas; and by the year 1882 the west or upper half of the valley was so entered and settled and like titles obtained."

Assuming as we must that the above quoted allegation by Kansas is true, the riparian and not the appropriation doctrine controls water uses in the Arkansas basin in Kansas. This conclusion would seem to be entirely supported by the record. No where is there any claim of an appropriation priority fixed by court decree or administrative permit. There was no administrative body to regulate irrigation in Kansas and no administration by any state water officials until 1933 (Tr. pp. 2646-2654, 5265-5271). There never has been any administration of the Syracuse or state line group of ditches (Tr. p. 5266). No records of ditch diversions in Kansas were kept until 1921 (Tr. p. 2670, 5266).

All these factors sustain our assertion that in Kansas irrigation is only of incidental or secondary importance.

The extent to which Kansas counsel would go to bolster their claims is shown by the assertion made on page 27 of their brief that in 1896 the Kansas irrigated acreage approximated 60,080 acres. This figure was obtained from certain unauthenticated pencil notes made on Kansas assessment records (Tr. p. 2702) and is inconsistent with all the other evidence in the case. At pages 108 to 111 of Appendix A to our opening brief we summarized the evidence describing the condition of the irrigation ditches and the extent of irrigation in western Kansas as assembled from testimony submitted by witnesses for the State of Kansas

in the former suit. Particular attention is again directed to statements that in 1895 little if any irrigation was then being accomplished; that the farmers were refusing to buy water and some were plowing up their irrigation laterals, while others instituted suit against the irrigation companies; that in the season of 1896 no attempt was made by the receiver to operate the Kansas ditches; that the services of the ditch superintendent were dispensed with; that the efforts of the receiver were directed solely to the sale of the ditches; and that in 1896 but one flood came down the river. Thus it is apparent that the claim asserted now, but not asserted in the original law suit, that there were over 60,000 acres irrigated in the basin in Kansas in 1896, constiutes another effort by Kansas to present a picture contrary to that presented in the former law suit in the hope of now obtaining relief which was then denied.

Indeed, the most serious and the most apparent switch in position has been the jump from the riparian to the appropriation theories of water law. In 1901 Kansas brought suit against Colorado upon the theory that Kansas was a riparian state. Now Kansas counsel assert that appropriation rights apply in western Kansas counties. To sustain their contention they cite Kansas statutes of 1868, 1885, 1886, and 1891 (Brief, pp. 21-22). *All of these statutes were in effect when the former suit was before this Court.*

THE 1916 SETTLEMENT.

The defendant's brief summarily disposes of the 1916 Settlement by asserting that neither the two states nor the defendant, The Finney County Water Users' Association, were a party to this contract (Brief, p. 32). There is no denial that the Colorado water users who signed that contract have lived up to their agreement by paying the money and performing the other obligations imposed upon them. One of two things is certain. Either the 1916 Settlement has an important bearing upon the determination of irrigation uses in the basin; or the Colorado water users were the victims of an enormous fraud.

As we argued in our opening brief, the 1916 Settlement must be considered along with the Kansas rotation agreement. The testimony of the witness Knapp, the official in charge of Kansas irrigation matters, is definite that he *would distribute any water allocated to Kansas in accordance with the rotation agreement* (Tr. p. 2667). This being the attitude of the responsible Kansas official a determination of the interstate equities requires consideration of the rotation agreement. It will be remembered that under this agreement the five Garden City ditches divide and rotate the water supply in accordance with a definite formula. All of these ditches participating in the rotation agreement, except the Farmers' ditch owned by the defendant, The Finney County Water Users' Association, were parties to the 1916 Settlement and by the terms of that settlement accepted a priority date of August 27, 1910, and the amounts of water therein specified as a definition of their rights against Colorado water users.

It is apparent from the testimony of Kansas engineer Knapp that if any additional water is secured in virtue of the rights of the Farmers' ditch, or in any other manner, he will distribute it under the rotation agreement. If this is done the four Kansas ditches who were parties to the 1916 Settlement will be securing benefits in direct violation of their solemn agreement with the Colorado water users. The Kansas ditches have not offered to return any of the consideration, approximately $150,000 (See App. A. p. 137), which they received from the Colorado water users. This is an equity case and fairness requires that before Kansas, who sues here either as *parens patriae* or trustee for its water users, can repudiate a solemn agreement made by its citizens and beneficiaries it must first offer to do equity. In private litigation a competent beneficiary cannot avoid a lawful agreement by acting through his trustee. States are said to have a temper superior to that of their citizens. States and state officials are presumed to be activated by legitimate motives. The attempted repudiation by Kansas of the 1916 Settlement does not

comport with that standard of conduct which should control interstate relations.

CADDOA RESERVOIR.

The contradictory Kansas attitude regarding Caddoa reservoir is bewildering and confusing. After joining in the 1933 Stipulation, which had as its underlying purpose the construction of Caddoa reservoir, and after its citizens and congressmen urged the building of the reservoir (See Colorado Brief, p. 91), Kansas asserts (Brief, p. 110) that by reason of the completion of the reservoir "substantially complete river depletion within Colorado will have become effective." In 1933 when the Stipulation was signed, in 1936 and 1938 when Caddoa was authorized and funds appropriated for its construction, Kansas made no claim that the project constituted any threat to it. Now, in 1943, realizing the weakness in its argument of increased stream depletion by Colorado and of injury to the substantial Kansas interests and desiring to have something upon which to base its claim for relief, Kansas reverses its position and shamelessly asserts that the reservoir, which it helped to secure, is a dangerous threat to it. This is but another of the many matters on which Kansas has changed its position.

In contrast to the Kansas attitude Colorado did not act to secure the construction of Caddoa by the United States until after the Stipulation was entered into and Colorado readily concedes that it solicited congressional support for the project and asserts that in so doing representations were made that the construction of the reservoir would afford a means for settling this serious controversy. Colorado does not repudiate the 1933 Stipulation. It will abide by its terms until this Court rules the agreement invalid.

After the assertion that the completion of Caddoa will effect a complete depletion of the stream by Colorado, there is this ambiguous paragraph found in the Kansas brief (pp. 113-114):

"The Caddoa reservoir belongs neither to Kansas nor Colorado. As a factor in this interstate water problem it will function on the same basis as every other reservoir constructed in Colorado in the Arkansas basin as a unit of regulation to capture surplus flood waters, and thereby complete in the most effective means possible the depletion of stream flow into Kansas. The capacity of the conservation pool, 385,000 acre-feet, represents its depletion possibility. Like the other 33 reservoirs in Colorado, with a storage capacity of 539,151 acre-feet, it represents purely an additional agency for depletion of water supply into Kansas. It is not an element which has any part in determining what equitable apportionment of the water supply should be adjudicated as belonging to the State of Kansas in her sovereign capacity. Only when a decree is entered, upon the basis of which delivery of water to Kansas can be compelled, does it enter this controversy, and then only as an agency along with other Colorado reservoirs or other Colorado sources of supply whereby replacement of water withheld from Kansas can be replaced in a practical and effective manner."

Frankly we are uncertain as to what this means. The idea that by conservation and storage in Caddoa reservoir Colorado can replace water withheld from Kansas is based upon two assumptions. First, that Colorado can use Caddoa for storage, and, second, that Colorado will withhold from Kansas water to which it is entitled.

There is one other idea expressed in the above paragraph from the Kansas brief which should be questioned. It is stated that Caddoa is an agency "along with other Colorado reservoirs" and can be used to replace water withheld from Kansas. Colorado, as a state, cannot compel the private individuals who own storage reservoirs in the Arkansas basin in Colorado to store water in their reservoirs for use in Kansas. Except for Caddoa,

every reservoir in the Colorado portion of the Arkansas basin is a private enterprise. The imposition of any requirement that one of these private enterprises should store water for use in Kansas would be a direct violation of either the Fifth or Fourteenth Amendments to the United States Constitution. Colorado water officials can refuse to permit unlawful diversions to these storage reservoirs. They cannot compel the storage of water therein against the wishes of the private owners.

In justification of the modifications which it seeks to the Master's recommendations Kansas says on pages 137-138 of its brief:

> "In the Caddoa channel reservoir alone a considerable portion of the flash floods hitherto passing across the state line will be impounded and controlled, and thus serve as a back log of water resource available to satisfy deliveries of water to Kansas as the same accrues. The Colorado administrative authorities will find that the amount credited for delivery to Kansas can be satisfied from water originating or impounded lower down on the stream, thus permitting their full use of such water as might pass the index stations."

Apparently Kansas' position is that it wants to have nothing whatever to do with Caddoa. It denies all interest in the reservoir and presents it as a Colorado problem which is first a threat and second a means of satisfying the Kansas demands. If the Kansas intent is to relinquish all rights to Caddoa reservoir, Colorado will accept the responsibility of endeavoring to work out with the Corps of Engineers a program for the most beneficial use of the conservation facilities of this reservoir. In offering to assume such responsibility Colorado points out that the record contains no evidence which even tends to prove that by the use of the storage facilities of Caddoa reservoir either the apportionment recommended by the Master, or

the highly exaggerated apportionment sought by the Kansas exceptions, can possibly be met without the curtailment of existing Colorado uses. To the contrary, Colorado says flatly that, if such a study were made, the result would prove the necessity for substantial reductions of Colorado diversions even though Caddoa were utilized in the most efficient manner. If the extreme modifications sought by Kansas were to be given effect, Caddoa storage would be woefully insufficient to satisfy the Kansas requirements without extreme curtailment of Colorado uses.

It must be recognized that the estimated life of Caddoa is about sixty years. Kansas recognizes this on page 109 of its brief. It is thus apparent that any decree based upon the use of Caddoa as a means of satisfying Kansas requirements would become outmoded with the progressive siltation of the reservoir.

A fair and equitable treatment of Caddoa is that contained in the 1933 Stipulation which provides that the benefits of conservation storage shall be divided equally between the two states. One of the purposes of the presentation of Colorado Operation Plan F was to show that this could be accomplished.

Finally in connection with Caddoa it should be pointed out that Kansas seeks to leave the impression that this channel reservoir affords a means of cutting out all state line flows to Kansas. On page 110 of its brief the flat statement is made that the state line flows may be "reduced to a few flash floods which might join the river flow in the 50-mile strip to the state line." Inconsistently Kansas admits (Brief p. 111) that the water produced below the reservoir cannot be controlled in any way by this reservoir. Attention is directed to the fact that between Caddoa and the state line there is a drainage area of 5,790 square miles tributary to the main river (See Colo. Ex. 205, App. B, p. 59). To clarify the matter we repeat here Table 32 found on page 147 of Appendix A:

TABLE 32

Average Discharge of Arkansas River At Caddoa and at Stateline

Diversions and Accretions Along River Section

(Values in Acre-Feet Are Averages for 1908-1938)

	Summer	Winter	Annual
Flow at Caddoa	233,100	62,600	295,700
Diversions of Colorado Ditches	117,800	41,100	158,900(a)
Balance—Undiverted	115,300	21,500	136,800
Accretions to Section	65,200	58,700	123,900(b)
Flow at Stateline	180,400	80,300	260,700

(a) Comparable with 160,000 acre-feet specified in 1933 Stipulation.
(b) Accretions below Caddoa constitute about ½ of total State line flow.

In the above table it is seen that approximately half of the historical state line flows originate below Caddoa. No storage of water in Caddoa can have any effect on such flows. These flows will in the future be increased as the use of Caddoa for conservation storage permits greater diversions by the Colorado ditches below Caddoa or by the Fort Lyon Canal System.

The benefits possible of achievement through conservation storage in Caddoa are discussed in our Appendix A, p. 145 *et seq.*

The situation with respect to Caddoa may be summed up by saying that it is neither the threat nor the cure-all which Kansas suggests but rather that it is an important factor which must be utilized to the fullest extent possible in any equitable apportionment made between the two states determining rights to the use of Arkansas river water.

MISCELLANEOUS MATTERS APPEARING IN THE DEFENDANTS' BRIEF WHICH ARE DISPUTED BY COLORADO.

In addition to the many matters heretofore discussed there are numerous minor details with which Colorado disagrees with the defendants. In order that there may be no mistake in our position we shall briefly direct attention to some of these.

On pages 14 and 15 Kansas copies Paragraph Second of the Master's Findings of Fact. Therein it is stated that the area of the Arkansas drainage basin in Colorado is 25,258 square miles and in Kansas 18,238 square miles. We say that the Colorado drainage area is 24,628 square miles and the Kansas drainage area 22,195 square miles. (See Colo. Ex. 205, App. B, p. 59, and App. A, p. 53). It might be observed in passing that in the former case this Court held that the drainage area of the Arkansas river in Colorado was 26,000 square miles and in Kansas 20,000 square miles (206 U. S. 105).

In the same paragraph from the Master's Findings it is stated that the elevation of the river at Canon City is about 4,900 feet. The correct figure, as shown on page 4 of Colorado's opening brief, is 5,363 feet.

The same paragraph in the Master's Findings quoted by Kansas gives the distance from the headwater branches to Canon City as 100 miles. Actually, as shown in Appendix A, page 54, the length is 130 miles. On page 17 of the Kansas brief it is stated that Larned is approximately 190 miles east of the state line or 230 miles by river channel and also about 100 miles above the point where the river crosses the Kansas-Oklahoma line. We say that the facts are that Larned is approximately 195 miles by river channel below the Colorado-Kansas line and approximately 195 miles above the Kansas-Oklahoma line.

At numerous places, for example, page 17, the Kansas brief states that the precipitation in the Colorado mountains runs from 20 to 30 inches annually. While it may be

true that precipitation on the higher mountain peaks and ranges may approximate 20 to 30 inches annually, it is also true, as indicated in the Colorado brief at page 4 and the precipitation map appearing in Appendix B, page 52, that the total precipitation in the valleys in the mountains is approximately 10 to 12 inches annually. An examination of the aforesaid precipitation map (Colo. Ex. 202) shows that the average annual precipitation at Buena Vista is 10.08 and at Salida 12.20. Both of these weather bureau stations are located in the mountains. For a description of the precipitation in the limited high mountain areas, we refer to our statement at page 54 of Appendix A.

On page 18 of the Kansas brief the statement is made that the region along the Arkansas river in western Kansas and Colorado is placed by the United States Government in its classification of land areas in the arid or irrigation section. In connection with such matters the United States Government operates through various agencies and departments. We know of no federal agency that has made the alleged classification. On the contrary the United States Census Bureau specifically classifies the State of Colorado as being one of the so-called arid states and specifically classifies the State of Kansas as being one of the sub-humid or semi-arid states. This matter is not of material importance. A complete and accurate description of precipitation as affecting the need for irrigation is found at pages 57 and 58 of our Appendix A.

The citation from the Master's report found at page 19 of the Kansas brief regarding temperature and wind movement being higher in western Kansas than in eastern Colorado is apparently intended to lay the foundation for claims later advanced to the effect that need for irrigation in western Kansas is the same as in eastern Colorado. Although counsel for Kansas have repeatedly made this assertion, it should be recalled that the Kansas witness Meeker specifically testified to the contrary. He submitted Kansas Exhibit 93 which shows that the irriga-

tion requirements on the land, so-called economic use of water, approximates 1.2 acre-feet per acre in eastern Colorado and approximates .8 acre-feet per acre at Garden City, Kansas. Likewise attention is directed to the fact that Colorado Exhibit 135 (App. B, p. 27), an excerpt from United States Department of Agriculture Technical Bulletin No. 36, shows the seasonal net irrigation requirement in acre-feet per acre to be 2.10 acre-feet per acre in south central Colorado, 2.30 acre-feet per acre in southeastern Colorado and 1.75 acre-feet in western Kansas. *Thus the theory of Kansas counsel is contrary not only to the testimony of their witness but also the findings of an impartial federal department.*

A statement appears at page 27 of the Kansas brief that the irrigation census of 1902 reported 212,341 acres irrigated in the Colorado counties of Pueblo, Otero, Crowley, Bent, and Prowers. The special irrigation census of 1902, although it reported total irrigated areas in the various states subdivided by stream basins, made no further segregations of the totals by counties and did not report the figure as alleged above.

On page 27 of the Kansas brief the statement is made that in the section between the state line and Garden City there is an area of only 29,239 acres in which irrigation is maintained without the use of supplemental water secured from pumping plants. Actually the record shows that the development of supplemental water supplies by means of wells and pumps has progressed in Kansas to the point that the irrigation commissioner for the state recommends to the water users that pump irrigation is more effective and cheaper than surface irrigation when control of stream flows by means of reservoirs is a necessary part of the surface irrigation program (See App. A, pp. 104-108). While it is true that increased acreages of irrigated land under the ditches of western Kansas are being served with supplemental supplies by means of wells and pumps, that development must be considered in the light of accom-

panying developments such as increased acreages of more valuable crops being planted today than at the time of the former suit. For example, sugar beets are planted and harvested each year upon a substantial portion of the irrigated acreage in the western Kansas Counties;[14] whereas at the time of the former suit none of the acreage was devoted to such a crop. In opposition to the argument advanced by the counsel for Kansas it should be said that Kansas has only recently undertaken to develop her locally available underground water resources and, having done so, is now largely independent of stream flows received from Colorado.

On page 29 the Kansas brief characterizes the mountain runoff as "impounded in those regions until released for use in the late spring and early summer". This is a grossly misleading statement. It implies practically a situation equivalent to reservoir storage. Colorado, of course, has no control whatsoever over the climatic conditions which determine when and how rapidly the mountain snow banks will melt.

MEMORANDUM OF THE UNITED STATES.

A memorandum has been filed by the United States as *amicus curiae* suggesting that the Recommended Decree of the Master be so modified as to eliminate language stating that the states are each the owner of the respective amounts of water apportioned. The memorandum proposes that this be done by the elimination of the words "the owner and" in Paragraphs One and Two of the Recommended Decree. The reason assigned is that the approval of such language by this Court might constitute a prejudging of the question of ownership which, though not an issue in this case, is a vital issue in the North Platte river case. *(Nebraska v. Wyoming and Colorado, United State Intervener,* Original No. 7). As we have heretofore

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[14] It appears from the report of Kansas irrigation commissioner Knapp that in the biennium 1920-1922, in the irrigated area between Dodge City and the state line there were 5,000—10,000 acres of sugar beets and some truck crops (Tr. pp. 1836-1837).

indicated at pages 96-97 of our opening brief we concur in the suggestion that the question of ownership should properly await decision in the North Platte case.

CONCLUSION.

For the second time in this century Colorado is before this Court to protect that portion of its domain which is dependent upon the waters of the Arkansas for the support of human life and endeavor. The first controversy between Colorado and Kansas ended thirty-six years ago with a decision which Colorado has always accepted as binding upon it. In the years that passed between that decision and the filing of this case, the individual Colorado water users were subjected to continuing and persistent attacks by Kansas water users. The Colorado people sought by concessions, agreements and money payments to secure peace. In these efforts they failed. To end disturbing private controversies, Colorado availed itself of the only possible remedy, a suit in this Court.

In presenting its cause for determination Colorado relies upon the 1907 decision as a binding determination that it was not then, by its water uses, exceeding its equitable share and says that since then it has done nothing to destroy the equitable apportionment between the two states of rights of use of Arkansas river water.

In opposing Colorado, Kansas presents legal arguments inconsistent with its arguments in 1907, asserts factual situations utterly different from those presented in the Kansas pleadings and discussed in the Court's opinion in 1907, repudiates agreements made by its citizens, and ignores a stipulation signed by its high officials. Such tactics are employed for the admitted purpose of securing water for land which was not irrigated at the time of the former case, is not irrigated now, and may never be irrigated even though existing Colorado uses are curtailed in order to increase the state line flows.

Colorado most sincerely desires peace with Kansas.

The price of peace should not be the destruction of a long established, successful and socially valuable economic development.

Respectfully submitted,

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Denver, Colorado,
September 27, 1943.

APPENDIX C.

A CRITICAL ANALYSIS OF THE EVIDENCE OF THE KANSAS WITNESS MEEKER PURPORTING TO SHOW STREAM DEPLETION BY COLORADO.

Under the heading of the principle of law controlling this case the argument is made, at page 46 of the Kansas Brief that the Master's finding of a material increase in the depletion of the river by Colorado since the original *Kansas v. Colorado* case is adequately supported by comparing the years of similar water supply and by evidence that since the close of testimony in that case consumption of water in Colorado has increased to the extent of 300,000 acre-feet of the average yearly dependable water supply. With respect to these alleged showings we have prepared certain tables which demonstrate the inconsistency of the quantities assumed or estimated by the witness Meeker upon which the entire showing of Kansas, in this connection, is based. Two different methods of demonstrating the inconsistency of the assumed values are submitted. One is to show how the assumed water production over the foothill and plains areas below Canon City compares with the annual average precipitation at stations scattered over that drainage area. This information is summarized in Tables 1 and 1(a). The second comparison, shown in Tables 2 and 2(a) shows the relations between the plains water production and the average annual precipitation. In each instance the water production figures are taken from Kansas Exhibits and the records of precipitation are taken from United States Weather Bureau reports.

In Table 1, we have selected the first ten years of the period employed by the witness Meeker in behalf of Kansas, namely, the period from 1895 to 1930 and have compared those years with the last ten years of the period, in each instance having excluded the so-called flood years of 1900 and 1905, in the early period, and of 1921 and 1923, in the recent period. The total production of water in the entire basin in Colorado as estimated or assumed by the witness Meeker is shown in column 2 of Table 1, and is taken from Kansas Exhibit 62. Production of water above

Canon City is shown in column 3, being values taken from various Kansas exhibits which correct the recorded flows at Canon City according to the quantities of water bypassed around the station, imported from other stream systems, withheld and released from upstream reservoirs, and consumed by the irrigation of lands along the river and its tributaries upstream from Canon City. The difference between columns 2 and 3, being the value shown in column 4, therefore, represents the amount of water assumed to have been produced in that portion of the drainage basin below Canon City. In column 5 are shown the annual amounts of precipitation at a group of United States Weather Bureau stations scattered over the drainage area.

Although the precipitation over the drainage area below Canon City during the first ten years of the study period was somewhat greater than the precipitation at the same stations during the last ten years of the study period, the witness Meeker assumes that the production of water over the drainage area below Canon City was greater by 250,200 acre-feet per year in the recent period. Manifestly, precipitation is the sole source of runoff. While there might be variations in the amounts of the precipitation which accumulate in stream channels, according to the intensity of the individual rain storms, such differences are eliminated, when groups of several years are compared, as in Table 1, for the reason that the character of the rainfall was identical, when considered as averages, in both of the periods. In order to bring out the inconsistencies of the Meeker assumptions, as to runoff from the drainage area below Canon City, Table 1(a) has been prepared in which the amounts of precipitation over the area below Canon City are arranged in the order of their magnitude. Right hand columns show the years and the assumed quantities of water produced in those years, whereas the left hand columns relate to the early period from 1896 to 1906. On the average the assumptions as to water production during the early period were some 250,000 acre-feet less than during the recent period, in each of which the amounts of precipitation were substantially the same. One of the most

flagrant cases of erroneous assumption appears in the record of 1906. As shown by the cross examination concerning the estimates of that year, at pages 2099-2106 of the transcript, the witness admits that he paid no attention to precipitation records, and in connection with the year 1906 admits that he assumed a small total water production even though all of the records of stream flows, both of the main river and all tributaries, and all the precipitation records showed that they were above average during that year.

A second way to present the same comparative data, and to indicate the inconsistencies in the Meeker assumptions, are shown in Tables 2 and 2(a). In this instance the natural flow at Canon City has been taken from Kansas Exhibit 25. Here the recorded flows have been corrected by the witness Meeker for bypassed, imported and stored waters. It will be recalled that the flow at Canon City purports to show 64% of the total mountain runoff. This relation comes from the ratio of 595,000 acre-feet to the total mountain runoff figure of 930,000 acre-feet. Assuming that the figures in column 2 represent 64% of the total mountain runoff, those in column 3 represent all or 100% of the mountain runoff, according to the witness Meeker. Comparing these values with the ones shown in column 4 which are his claimed total water production figures, per Kansas Exhibit 70, the differences are necessarily his assumed or estimated values for plains runoff. These are shown in column 5. It will be noted that in three of the years of the early period the total basin production is less than the calculated mountain water supplies. In other words Mr. Meeker has assumed that the runoff from the plains area in those three years was a minus value. As will be noted from column 6 showing the average precipitation below Canon City, Mr. Meeker assumes values for the plains runoff in the early period averaging 124,500 acre-feet, at a time when precipitation averaged 15.42 inches, whereas for the recent period, and from a lower average annual precipitation, he estimates the plains runoff at 352,700 acre-feet or 228,200 acre-feet more than was estimated

for the early period even though the rainfall of the early period was larger in amount.

The same information contained in Table 2 is shown in a different arrangement on Table 2(a). For example in the year 1925 when the average precipitation over the plains area was 13.90 inches Mr. Meeker estimates the plains water production at 423,000 acre-feet. In years of the early period when precipitation was comparable in amount he estimates plains runoff at 73,000 acre-feet as in 1896 or 53,000 acre-feet as in 1901. Again comparing his estimate of 287,000 acre-feet of plains runoff in 1920, when precipitation was 14.55 inches, he estimates that the plains runoff in 1899 was a minus 104,000 acre-feet. As compared with estimates of 418,000 acre-feet in 1929 and 535,000 acre-feet in 1927, when the rainfall approximated 15.87 inches, Mr. Meeker assumes that in earlier years when the rainfall was comparable, the plains runoff was minus 72,000 acre-feet as in 1897, or was 106,000 acre-feet as in 1898. Comparing the years when rainfall was largest Mr. Meeker says that the plains runoff in 1928 was 469,000 acre-feet, the precipitation for that year averaged 17.23 inches, whereas for the year 1906, when the precipitation averaged 17.50 inches his figures purport to show that the plains runoff was a minus 41,000 acre-feet.

Having set up estimates of total water production, which include the extremely low and inconsistent values noted for the years of the earlier period, the counsel for Kansas then attempt to make comparisons of the amounts of State line flow comparing years when he says the total water production was the same. The fact is, as indicated above, that the Kansas counsel are not comparing years of equal water production.

TABLE 1

WATER PRODUCTION BELOW CANON CITY PER KANSAS EXHIBITS COMPARED WITH PRECIPITATION PER U. S. W. B. RECORDS

(1) Year	(2) Total Production Basin in Colorado	(3) Production Above Canon City	(4) Production Below Canon City	(5) Average Precipitation Below Canon City
1895	1,200.000	682,000	518,000	16.79
1896	720,000	459,000	261,000	13.22
1897	750,000	571,000	179,000	15.49
1898	900,000	553,000	347,000	15.88
1899	990,000	745,000	245,000	14.26
1901	820,000	537,000	283,000	14.22
1902	750,000	328,000	422,000	14.87
1903	1,020,000	559,000	461,000	14.82
1904	1,200,000	497,000	703,000	17.12
1906	990,000	710,000	280,000	17.50
Avge.-A	934,000	564,100	369,900	15.42
1919	1,270,000	695,350	674,650	16.72
1920	1,370,000	758,440	611,560	14.55
1922	970,000	562,910	407,090	13.19
1924	1,220,000	665,850	554,150	10.55
1925	1,100,000	476,940	623,060	13.90
1926	1,110,000	599,050	510,950	13.04
1927	1,510,000	678,820	831,180	15.87
1928	1,360,000	619,750	740,250	17.23
1929	1,410,000	692,640	717,360	15.60
1930	1,170,000	539,100	630,900	16.83
Avge.-B	1,249,000	628,900	620,100	14.75

A—First 10 years, exclusive of 1900 and 1905.

B—Last 10-years, exclusive of 1921 and 1923.

(2)—Per Kansas Exhibit 62.

(3)—From Kansas Exhibits 18, 20, 23, 24, 59 and 135.

(4)—Difference between Col. (2) and Col. (3).

(5)—Precipitation (inches annually) averaged for Stations: Canon City, Cheyenne Wells, Colorado Springs, Holly, Lake Moraine, Lamar, Las Animas, Limon, Pueblo, Rocky Ford, Trinidad and Two Buttes.

(Lake Moraine included because it is in headwater area of Beaver Creek and Fountain Creek.)

The above precipitation figures are taken from the publication of the United States Department of Agriculture, Weather Bureau, entitled "Climatic Summary of the United States—Climatic Data herein from Establishment of Stations to 1930, Inclusive—Section 24—Southeastern Colorado," pages 24-7 to 24-15.

TABLE 1(a)

WATER PRODUCTION BELOW CANON CITY PER KANSAS EXHIBITS COMPARED WITH PRECIPITATION PER U. S. W. B. RECORDS

EARLY PERIOD				RECENT PERIOD	
Year	Acre-Feet	Precipitation Below Canon City		Acre-Feet	Year
			10.55	554,150	1924
			13.04	510,950	1926
			13.19	407,090	1922
1896	261,000	13.22			
			13.90	623,060	1925
1901	283,000	14.22			
1899	347,000	14.26			
			14.55	611,560	1920
1903	461,000	14.82			
1902	422,000	14.87			
1897	179,000	15.49			
			15.60	717,360	1929
			15.87	831,180	1927
1898	347,000	15.88			
			16.72	674,650	1919
1895	518,000	16.79			
			16.83	630,900	1930
1904	730,000	17.12			
			17.23	740,250	1928
1906*	280,000	17.50			
Avge.-A	369,900	15.42	14.75	620,100	Avge.-B

*See Tr, pp. 2099-2106 for cross-examination year 1906.

TABLE 2

PLAINS WATER PRODUCTION PER KANSAS EXHIBITS COMPARED WITH PRECIPITATION PER U. S. WEATHER BUREAU RECORDS

(1) Year	(2) Natural Flow at Canon City	(3) Total Mountain Water Production	(4) Total Production Basin in Colorado	(5) Balance Computed Plains Production	(6) Average Precipitation Below Canon City
1895	636,000	994,000	1,200,000	206,000	16.79
1896	414,000	647,000	720,000	73,000	13.22
1897	526,000	822,000	750,000	- 72,000*	15.49
1898	508,000	794,000	900,000	106,000	15.88
1899	700,000	1,094,000	990,000	-104,000*	14.26
1901	491,000	767,000	820,000	53,000	14.22
1902	284,000	444,000	750,000	306,000	14.87
1903	512,000	800,000	1,020,000	220,000	14.82
1904	449,000	702,000	1,200,000	498,000	17.12
1906	660,000	1,031,000	990,000	- 41,000*	17.50
Avge.-A	518,000	809,500	934,000	124,500	15.42
1919	635,000	992,000	1,270,000	278,000	16.72
1920	693,000	1,083,000	1,370,000	287,000	14.55
1922	508,000	794,000	970,000	176,000	13.19
1924	605,000	945,000	1,220,000	275,000	10.55
1925	433,000	677,000	1,100,000	423,000	13.90
1926	544,000	850,000	1,110,000	260,000	13.04
1927	624,000	975,000	1,510,000	535,000	15.87
1928	570,000	891,000	1,360,000	469,000	17.23
1929	635,000	992,000	1,410,000	418,000	15.60
1930	489,000	764,000	1,170,000	406,000	16.83
Avge.-B	573,600	896,300	1,249,000	352,700	14.75

A —First 10 years, exclusive of 1900 and 1905.

B —Last 10 years, exclusive of 1921 and 1923.

(2)—Per Kansas Exhibit 25.

(3)—Calculated Col. 2, divided by 64% (Ratio 595,000:930,000).

(4)—Per Kansas Exhibit 70.

(5)—Difference Col. (4) minus Col. (3).

(6)—Precipitation (inches annually) averaged for stations: Canon City, Cheyenne Wells, Colorado Springs, Holly, Lake Moraine, Lamar, Las Animas, Limon, Pueblo, Rocky Ford, Trinidad, and Two Buttes. Values taken from same source as indicated on Table 1 *supra*.

(Lake Moraine included because it is in headwater area of Beaver Creek and Fountain Creek.)

*Years when total basin production less than mountain production.

TABLE 2(a)

PLAINS WATER PRODUCTION PER KANSAS EXHIBITS COMPARED WITH PRECIPITATION PER U. S. WEATHER BUREAU RECORDS

EARLY PERIOD		Precipitation Over Plains Region		RECENT PERIOD	
Year	Acre-Feet			Acre-Feet	Year
			10.55	275,000	1924
			13.04	260,000	1926
			13.19	176,000	1922
1896	73,000	13.22			
			13.90	423,000	1925
1901	53,000	14.22			
1899	-104,000*	14.26			
			14.55	287,000	1920
1903	220,000	14.82			
1902	306,000	14.87			
1897	- 72,000*	15.49			
			15.60	418,000	1929
			15.87	535,000	1927
1898	106,000	15.88			
			16.72	278,000	1919
1895	206,000	16.79			
			16.83	406,000	1930
1904	498,000	17.12			
			17.23	469,000	1928
1906	- 41,000*	17.50			
Avge.-A	124,500	15.42	14.75	352,700	Avge.-B

*Indicates seasons when plains runoff assumed at the minus amounts shown.

ABSTRACT OF TESTIMONY OF R. I. MEEKER, CROSS-EXAMINATION, TRANSCRIPT PAGES 2099-2106 CONCERNING THE YEAR 1906.

Q. What character of water-supply year do you find 1906 to be, according to your method of determining?

A. A 80 percent year, according to the total water supply of the basin.

Q. The way of arriving at that is the ratio between your estimated total water supply of 990,000 acre-feet in 1906 compared with the average annual total water supply of 1,240,000 acre-feet?

A. That is the ratio.

Q. According to your Exhibit 18, the recorded stream flow at Canon City in 1906 was 605,000 acre-feet, was it not?

A. That is correct.

Q. Comparing this to the mean for that station, of 550,000 acre-feet, indicates the main stem mountain runoff was 110%, or 10% above normal?

A. Correcting for the ditch diversion shown in Kansas Exhibit 25 it checks out 112%.

Q. The annual flow corrected was 660,000 acre-feet, according to Exhibit 25?

A. Yes, sir.

Q. As compared to the average, computed on this basis, of 595,000 acre-feet, the runoff from the mountains above Canon City was 111% or 11% above normal?

A. That is true.

Q. The only other record evidence relating to mountain water supply, found among your exhibits, other than the main river at Canon City, is Exhibit 29, showing the discharge of West Beaver Creek in 1906 to have been 17,234 acre-feet?

A. That is true on the tributaries.

Q. This West Beaver Creek record for 1906 compared to the average of 13,785 acre-feet, indicates that portion of the mountain supply was 125%, or 25% above normal?

A. That is true.

Q. Have you any other record evidence as to the probable mountain water supply in the year 1906?

A. That is all of the measured runoff.

Q. Now, turn to the plains or tributary water supply: have you any record evidence of its character, other than that of the records of precipitation?

A. The only record I have, is the outflow at the Kansas

State line for that year, plus the consumptive use, which gives the gross quantity.

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The records of precipitation, being official records of the United States Weather Bureau show that the rainfall in 1906 compared with normal amounts of annual precipitation as follows, each of which values were admitted by the witness Meeker:

	1906	Normal
Colorado Springs	16.95	14.46
Canon City	15.62	12.64
Pueblo	11.00	11.56
Trinidad	16.77	17.03
Rocky Ford	14.66	12.39
Hamps	19.07	14.35
Las Animas	16.95	12.29
Lamar	19.83	15.56
Holly	15.65	14.67
Cheyenne Wells	19.37	17.18
Two Buttes	18.44	15.35
Averages	16.75(a)	14.31(b)

(a) If the Lake Moraine station was added to the list of eleven stations the average would be 17.50 inches instead of 16.75. (Precipitation at Lake Moraine in 1906 was 25.63 inches.)

(b) Normals are from the 1922 Climatic Summary of the U. S. Weather Bureau, Section 7, Southeastern Colorado. Normal for Lake Moraine is shown in that summary to be 24.75 inches. Normal for 12 stations including Lake Moraine would be 15.19 inches instead of 14.31 inches.

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Q. So that of the eleven precipitation records scattered over the plains area, only two, Pueblo and Trinidid, received less than normal rainfall in 1906?

A. I believe that is the situation.

Q. The average of the whole group would show the year to have received 16.75 inches of precipitation which (as compared to the average of 14.31 inches) is about 115% of normal, would it not?

A. That is substantially correct.

Q. Now does not this situation arise: that you have deduced a water supply for 1906, which is about 20% below average, during a year when the mountain water supply,

as reported, was about 12% above average, and the rainfall over the plains area was about 15% above normal?

A. That is true.

The questions and answers, at pages 2104 and following, may be summarized somewhat as follows:

If all of the mountain runoff be assumed at 11% or 12% above average, as indicated for the main river by the record at Canon City at 111%, and as indicated for mountain tributaries by West Divide Creek at 125%, then the item of total mountain runoff in 1906 would be about 1,055,000 acre-feet. Since this mountain runoff exceeds the total water supply of the entire basin for the year 1906 of 990,000 acre-feet, as shown by Kansas Exhibit 70, the method of calculating the total water supply of the year amounts, in fact, to assuming that the plains supply was a minus value—a conclusion that manifestly is also erroneous, for such a condition is impossible. If the plains runoff had been estimated at the same amount, in relation to average annual plains runoff, as indicated by the relations between 1906 and normal precipitation then the plains runoff would have approximated 400,000 acre-feet in the year 1906. This added to the previously calculated mountain runoff of 1,055,000 acre-feet would have given an indicated total for 1906 of 1,455,000 acre-feet. Mr. Meeker attempts to prove that such an assumption as to the total water supply of the basin in 1906, would be inaccurate, by subtracting the total State line outflow of 260,000 acre-feet from the deduced figure of 1,455,000 acre-feet leaving a balance of 1,195,000 acre-feet which would constitute the consumption of water in Colorado during the year 1906. His analytical study (which is merely a multiplication of an irrigated acreage by an assumed rate per acre) shows a water consumption of only 730,000 acre-feet, or 465,000 acre-feet less than the total consumption as above calculated. Mr. Meeker says that when the indicated total consumption of 1,195,000 acre-feet is evaluated as against the 383,000 acres of land irrigated in 1906, the unit rate of consumptive use would

be 3.1 acre-feet per acre. He says that such a rate is not confirmed or supported by any information available to him.

He admits, however, (page 2107) that his calculations for the year 1914 showed a water consumption per acre irrigated in Colorado of 2.85 acre-feet per acre, so that it would not have been impossible for the consumption, in 1906, to have been as much as the indicated 3.1 acre-feet per acre, and yet for this year of 1906 Mr. Meeker prefers to assume a figure of 1.64 acre-feet per acre and thus to arrive at a figure of total water consumption in Colorado, which is wholly inconsistent with all available records, including the recorded flows of the Arkansas River at Canon City, the records of mountain tributaries (to the limited extent that such records were available), and the records as to rainfall over the plains drainage area, concerning which there were no records of tributary runoff.

Manifestly by such a method of initial assumption anything can be proven that might in advance be thought advisable.

Mr. Meeker attempts to defend his assumed rate as opposed to the foregoing calculated rate of consumptive use on the ground that his Exhibit 67, showing the curve of reservoir capacity indicates that a large capacity, about 300,000 acre-feet, was imposed on the river about 1912. This curve of so-called reservoir capacity, itself is of questionable accuracy. The point, however, at this time is that the effects of reservoirs along the Arkansas River were taken into account during the period of so-called analytical study from 1912 to 1930, but were wholly ignored during the period from 1895 to 1911. In other words, during the period 1912 to 1930 the resulting figures of consumptive use as calculated by the witness Meeker, include the effects of (a) agricultural consumption; (b) reservoir operations; and (c) ground water storage. However, his assumed values for consumptive use during the earlier period are based on estimates of agricultural consumption and wholly ignore the other two factors. Not only was storage a material factor in 1906 and in years prior thereto, but the matter

of ground water storage was a much greater factor during the early period of 1895 to 1911 than it has been during the recent period from 1912 to 1930. For this reason the rates of consumptive use during the early period would necessarily be materially greater than those of the recent period, if the factor of ground water storage had been taken into account.

TESTIMONY CONCERNING THE YEAR 1914—
TRANSCRIPT PAGES 2109-2110.

As has been heretofore indicated, by tables 1 and 2, and by the previous discussion of the records concerning the year 1906, the assumed or estimated values as to water production and water consumption in Colorado during the early period 1895 to 1911 were consistently low or too small. At the same time the estimates of water production and water consumption during the recent period 1912 to 1930, in general, are greater than investigators for Colorado feel that they should be. For example the records for the year 1914 referred to several times by the witness Meeker, show that the mountain runoff, based on the water supply at Canon City, was 130%, or 30% above normal. Official records of the United States Weather Bureau show that precipitation over the plains area in Colorado during 1914 was 126% of normal. Assuming that the mountain and plains runoff varied from normal in direct proportion to the recorded amounts of stream flow and plains precipitation, the total water supply of the season of 1914 would be 1,660,000 acre-feet. The total water supply as estimated or deduced by Mr. Meeker in 1914 was 1,960,000 acre-feet, or 300,000 acre-feet more than arrived at by the computations based directly upon the recorded stream flows and amounts of precipitation. Because the estimated amounts of total water production and total water consumption in Colorado were believed by Colorado to be too high in the recent years, and too low in the early years, as calculated by Mr. Meeker, no serious objection has been made by Colorado as to his estimated average annual water supply. However, the fact that the estimates were consistently too low in the early years and were too high in some of the

recent years (as indicated by the year 1914), permits of the claim advanced by the State of Kansas, of increased depletions in Colorado, to which the State of Colorado strenuously objects.